February 1983

Incorporating Spectrum User

sinclair user

Issue No 11

Only 75p

100 FANTASTIC FACT-FILLED PAGES

HOME ARCADES— A NEW CRAZE

Our guide to brighter programming

Eleven pages of programs

Complex Spectrum graphics revealed

Tips on saving memory

Zeaker— we reveal its secret



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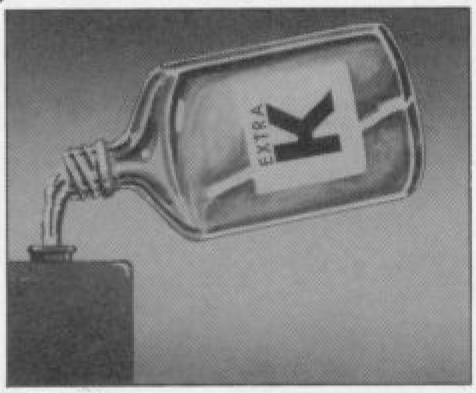
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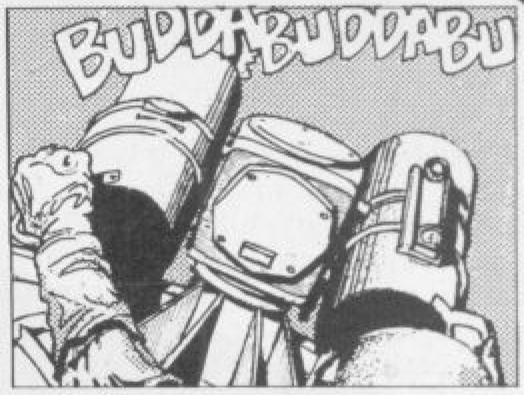
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We pay £10 for each program published and £50 per 1,000 words for each article used.

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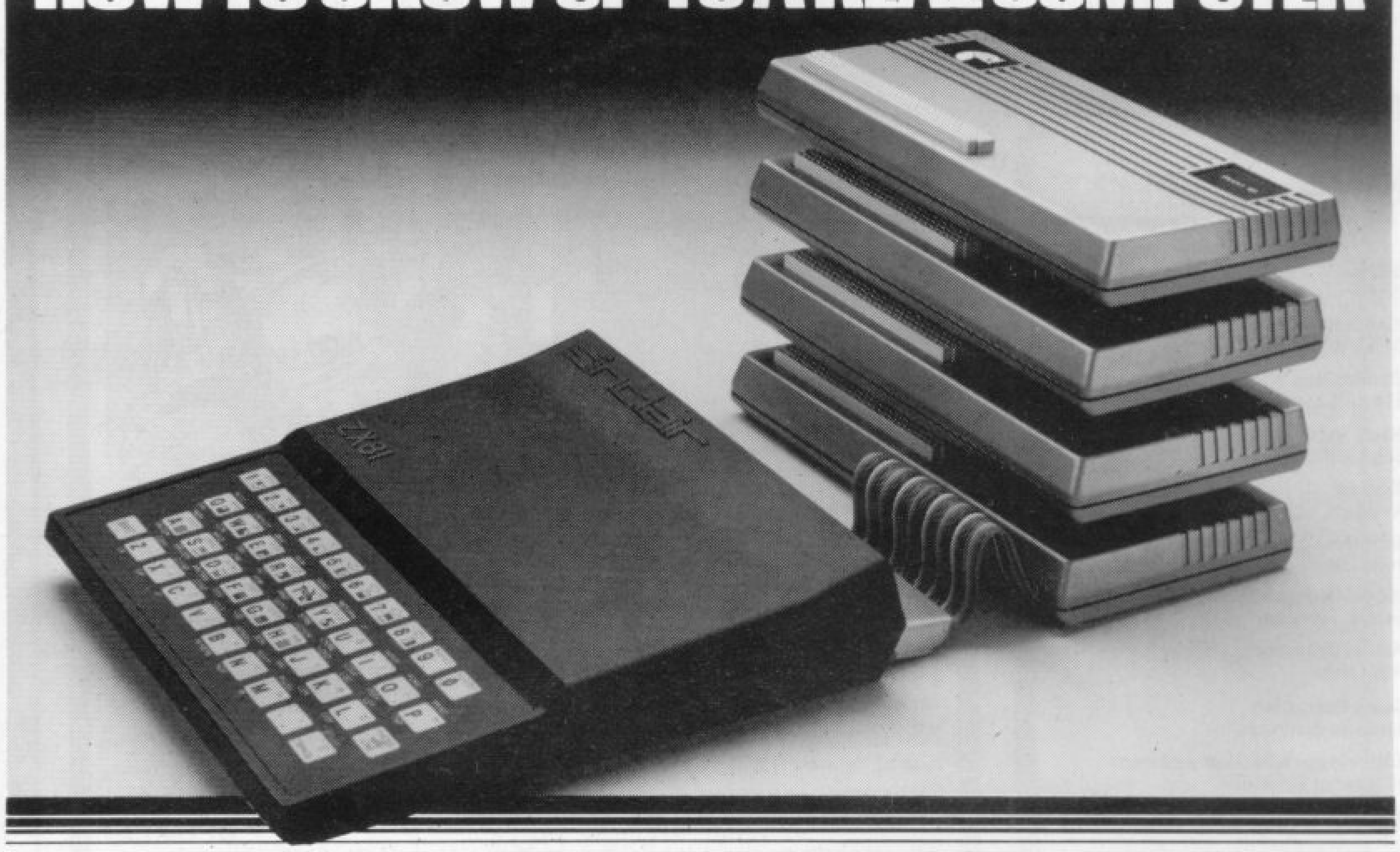


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NEXT MONTH

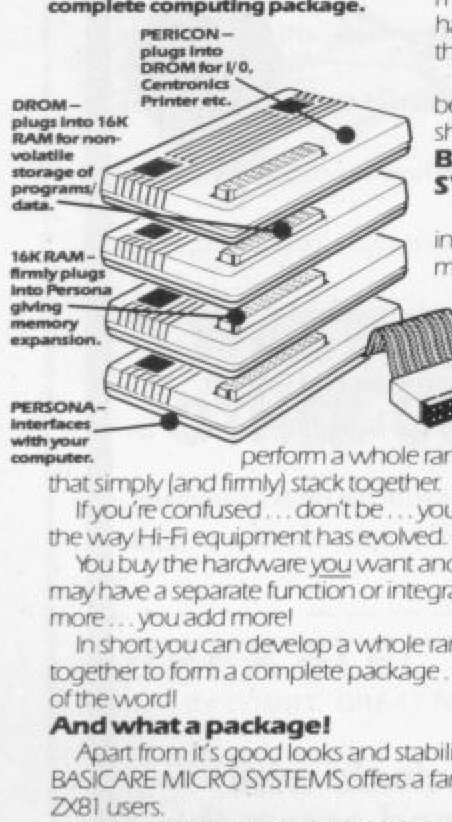
We profile the company which deals with Sinclair Research distribution and assess the new range of software from Sinclair Research.

HOW TO GROW UP TO A REAL COMPUTER



If you're enthusiastic about microcomputing, sooner or later you'll ask yourself the question . . . "where do I go from here?"

How BASICARE build into a complete computing package.



This is particularly true if you own a micro with limited expansion and hardware peripheral options . . . like the ZX81.

Now your question can be answered in three short words:

BASICARE MICRO SYSTEMS

BASICARE are the inventors, developers and manufacturers of a totally unique microcomputing upgrade system.

It's the sort of system others have dreamed about . . . a series of separate modules that perform a whole range of microcomputing functions that simply (and firmly) stack together.

If you're confused . . . don't be . . . you only have to think of it in terms of the way Hi-Fi equipment has evolved.

You buy the hardware you want and add to the system! Each module may have a separate function or integrate functions. And when you want more . . . you add more!

In short you can develop a whole range of hardware options that fit together to form a complete package . . . "Computing" in the real sense of the word!

And what a package!

Apart from it's good looks and stability under working conditions, BASICARE MICRO SYSTEMS offers a fantastic range of micro options for ZX81 users.

Of course, such a system needs a starting point from which to expand. The heart of BASICARE'S system is a unique computer interface which we call PERSONA.

This one unit simply plugs into your ZX81 without modification and acts as the "brains" of the whole operation.

Thereafter you choose how you want to expand your micro by simply plugging-in more modules.

Look at the choice you have:

PERSONA – An interface module to enable an ORGANIC MICRO to grow on the ZX81.
MINIMAP – A memory mapping device to extend the address space of the ZX81 from 64K bytes to 1 M bytes.
RAM 08 – A low cost, low power memory expandable from 2K to 8K.
RAM 16 – 16K Add on memory at remarkably low cost.
RAM 64 – A TRUE 64K Add on memory.
DROM – Ultra low power memory backed by rechargeable battery for non-volatile storage of programs and data.
TOOLKIT – A module fully socketed to take up to 8K bytes of utilities in EPROM/ROM.
PERICON a – A general purpose, user programmable device providing 24 lines of input/output.
PERICON b – 24 lines of heavy duty output to access and control the outside world.
PERICON c – A module to drive 80 column printer with Centronics type parallel interface.
USERFONT option – User definable characters available for RAM 08, DROM and TOOLKIT.

Of course, there's lots more BASICARE Modules under development including joysticks, EPROM Programmer, Floppy Disc Controller and much more.

BASICARE is the sort of system that GROWS when you grow . . . and remember, when you change your micro, you will be able to change to a PERSONA unit to suit your new equipment!

In short, BASICARE will serve you forever . . . no matter how big you want to grow!

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BASICARE MICRO SYSTEMS are available by mail simply by sending today together with cheque/PO/Access or Barclaycard No. Please indicate clearly your exact requirements.

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PERSONA	@ **£30.25**	DROM(2K)	@ **£39.50**
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Options: USERFONT @ £8.00,
Add. 2K for RAM8 @ **£6.50,** Add. 2K for DROM @ **£7.50**

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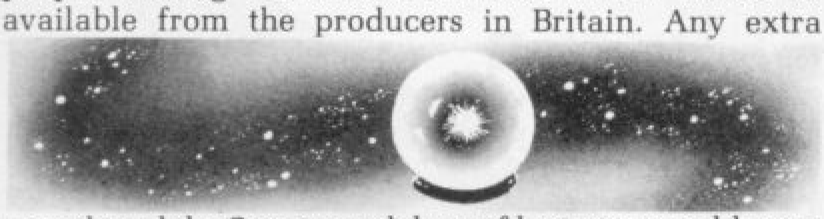
BASICARE MICRO SYSTEM



Same game, different rules

IF THE CALL for a year's ban on imports of micros is agreed by the Government, it will have a dramatic effect on the home computing market. No longer would there be the present choice for the growing thousands wishing to upgrade their computing capabilities, having had their appetites whetted by the ZX-81.

An increase in the size of the market, similar to that achieved last year, would mean tens of thousands of people chasing the limited numbers which would be available from the producers in Britain. Any extra



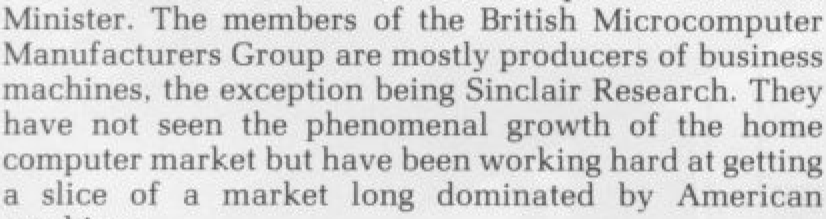
growth and the Spectrum delays of last year would seem to be short by comparison.

Consider a situation in which there would be no Apples, Commodores or any of the theoretical Japanese invasion. Despite the growing numbers of British machines, it is unlikely that they would be able to cope with the orders.

Having said that, it is easy to understand why British micro manufacturers have made their pleas to the Prime Minister. The members of the British Microcomputer Manufacturers Group are mostly producers of business machines, the exception being Sinclair Research. They have not seen the phenomenal growth of the home computer market but have been working hard at getting a slice of a market long dominated by American machines.

Now they fear their work might all have been in vain, because the Japanese threaten to invade the market. They have seen what happened to the car industry, the motor-cycle industry, the hi-fi industry and the television industry, and they fear it could happen to them.

They see the help the Japanese competition receives from its government, money to help with new



developments and exports being only two items, and the ability to consider the market in the long term because each company has the backing of its own conglomerate, and they realise their pricing cannot be on the same basis and is likely to result in lower prices.

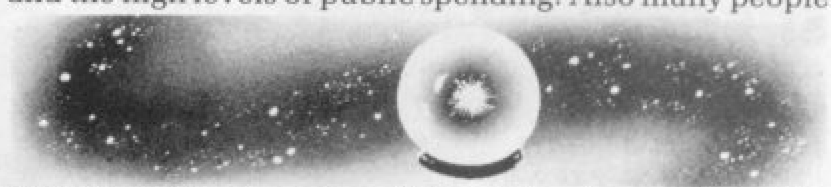
By contrast, the Government seems to be doing all it can to discourage our industry from growing. Despite the financial support it has been willing to give to companies to develop their products, it has refused to adopt a buy-British policy for micros in Government departments and imposes a 17 percent levy on imports of electronic components used by the British industry in making its machines, whereas the duty on completed machines is only between six and eight percent.

The fears of British manufacturers are compounded by having seen the first of the Japanese machines making a brief appearance on the scene. Names like Epson, Sony and Sharp, no strangers to the British market for a variety of other products, have all produced machines which are threatening to make an appearance in Britain.

Added to that there is the assumption by many people that, if a subject has anything to do with electronics, the Japanese are bound to be better at it than the rest of the world. A BBC television program before Christmas introduced its viewers to the uses of the Spectrum, Dragon and BBC Model B, but saved its greatest praise for the new portable Epson machine, despite the fact that the markets at which each of the machines was aimed was different.

It also failed to mention that the British machines were available immediately and had been for some time, while the Japanese machine had yet to prove itself in the market.

While accepting that the Japanese have been very successful in a limited number of markets, they are not infallible. They have their problems with unemployment and the high levels of public spending. Also many people



forget that the most successful country at exporting in the world is Britain.

On that basis it would be better for the British industry to concentrate on its strengths and forget about asking for help in the form of a blanket ban for a year. Apart from the difficultly in achieving the objective, many importers would know about the possibility of a ban and would stockpile the necessary number of machines and there would be the danger of competitors imposing even more stringent import controls. The aim of Sinclair to break into the Japanese market would then get nowhere.

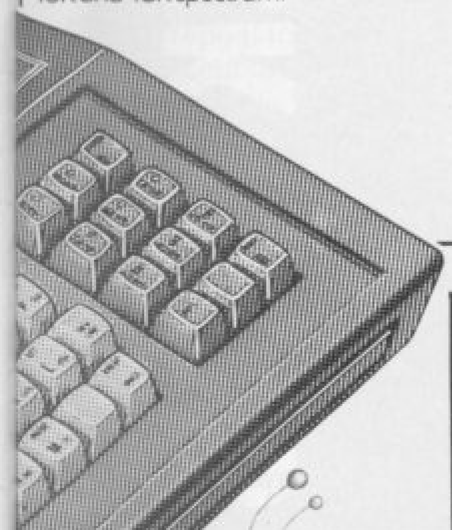
A better course would be for the industry first to start believing in itself. Anyone who doubts the ability of the British to adapt to new markets should study what has happened in the Sinclair market in the last year. While being only a small part of industry's output, it is a good example of what can be achieved with a little ingenuity.

The Government could then build on that expertise by accepting the arguments of Clive Sinclair and removing some of the obstacles to growth. This will be a year in which the direction of home computing will be set. There are a number of ways in which the Government can help it move to the advantage of British manufacturers — but an import ban is not one of them.

ZX 80~81 Spectrum HARDWARE

4K TOOLKIT

This is the toolkit which won acclaim in the feature in the August 1982 issue (pages 29 and 30) of Sinclair User. "It is the most impressive program, fast in execution with clear and full instructions...it stands out from the rest of the field." The ZXED is a powerful editor for use on the expanded ZX81. It is intended for use by the serious BASIC programmer and offers several useful and time saving features most helpful during all stages of program development. The facilities provided are as follows: ALTER, BYTES, COPY, DELETE, FIND, HELP, INSERT, KEEP, MOVE, RENUMBER AND VERIFY. The Spectrum Toolkit contains most of the features above plus autoline numberer and append, and will run in the 16K and 48K spectrum.



Both at only £6.95

4K GRAPHICS ROM £24.95

The DK Graphic module is our latest ZX 81 accessory. This module unlike most other accessories fits neatly inside your computer under the keyboard. The module comes ready built, fully tested and complete with a 4K graphic ROM. This will give you an unbelievable 448 extra pre-programmed graphics, your normal graphic set contains only 64. This means that you now have 512 graphics and with their inverse 1024. This now turns the 81 into a very powerful computer with a graphic set rarely found on larger more expensive machines. In the ROM are lower case letters, bombs, bullets, rockets, tanks, a complete set of invaders graphics and that only accounts for about 50 of them, there are still about 400 left (that may give you an idea as to the scope of the new ROM). However, the module does not finish there, it also has a spare holder on the board which will accept a further 4K of ROM/RAM. This holder can be fitted with a 1K/2K/RAM and can be used for user definable graphics so you can create your own custom character sets.

WHY WAIT?
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FLEXIBLE RIBBON CONNECTOR

If you have ever had whiteouts or system crashes this could be the answer. It stops the movement between the computer and the RAM expansion, it is supplied with a ribbon, 6 inches long, with a male connector at one end and a female at the other, at only

£10



16/64 MEMORY FOR ZX 81



16K Memory £22.95
16K (uncased) £19.95
64K Memory £52.95
64K (uncased) £49.95

The above illustration shows the casing for the 16K or massive 64K.

MEMORY

16K MEMORY EXPANSION £22.95

The 16K used 4116 Dynamic Ram Chips. We use the dynamic because they are much denser than static ram and occupy less space. They are also much cheaper than the equivalent product using the static Ram. The Ram is manufactured with high quality materials and uses high speed low power Rams. It is supplied ready-built and only needs to be plugged into the rear of the computer. All the components are fitted into holders. This massive add on memory which comes to you fully assembled and tested is the cheapest 16K memory available anywhere. Position in memory from 163834 to 32768 (same as the Sinclair Memory). **16K (UNCASED) £19.95**

64K MEMORY EXPANSION £52.95

All the above information on the 16K also applies to the 64K Memory Expansion, but the advantage lies in the 64K giving nearly four times the memory. This advanced model has 56K of usable memory. In addition, the block from 8K to 16K can be switched out to enable the use of other add-ons. The graphics Rom is to be used in this area. Position in Memory: 8192-65536. The block from 81¾2-16384 is switchable. **64K (UNCASED) £49.95**

Please state type of machine, which Rom memory size, quantity and place when ordering.

Please send me . . . . @ £. . . . .
Please send me . . . . @ £. . . . .
Please send me . . . . @ £. . . . .
Please add on £1.25 for P/P
In enclose cheque/P.O. payable to DK Tronics total £ . . . .
or debit my Access/Barclaycard

Signature . . . .
Name . . . .
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Send to DK Tronics, 23 Sussex Road, Gorleston, Gt. Yarmouth, Norfolk.
Tel: Gt. Yarmouth (0493) 602453

dk'tronics

New colour brochure now available, send SAE for quick return

Hilderbay offer repeated

FOLLOWING the success of our offer to members in October, we have decided to repeat the discount of 10 percent on the full range of hardware and software from Hilderbay.

The items include a number of business programs, such as **Payroll, Stock Control** and **Critical Path Analysis** both for the ZX-81 and the 48K Spectrum. There are other cassettes for the more serious user which are available only for the ZX-81, such as **Budget** and **Financial Pack.**

In addition, we can make a pre-publication offer on a book being published shortly, *Guide to the Spectrum ROM*. It is not yet generally available but can be bought by members at the special price of £2.95.

Hilderbay	List price	Offer price
48K Spectrum		
Critical path analysis	**£15.00**	**£13.50**
Payroll	**£25.00**	**£22.50**
Stock Control	**£25.00**	**£22.50**
Gold (game)	**£8.00**	**£7.20**
ZX-81		
Beamscan	**£25.00**	**£22.50**
Budget	**£15.00**	**£13.50**
Critical path analysis	**£15.00**	**£13.50**
Financial Pack	**£8.00**	**£7.20**
Optimax	**£40.00**	**£36.00**
Payroll	**£25.00**	**£22.50**
Stock control	**£25.00**	**£22.50**
Time Ledger	**£15.00**	**£13.50**
Gold	**£6.00**	**£5.40**
Tape accessories		
Alignment and test cassette	**£4.90**	**£4.40**
Loading aid	**£5.95**	**£5.35**
Microcomputer Tape Book	**£3.10**	**£2.80**
Pre-publication offer		
The Guide to the Spectrum ROM		**£2.95**

Mikro-gen	List price	Offer price
Spectrum		
Scramble	**£5.50**	**£4.40**
Masterchess (48K)	**£6.95**	**£5.55**
Sorcerer's Castle (48K)	**£6.50**	**£5.20**
ZX-81		
Scramble	**£3.95**	**£3.15**
Frogs	**£3.95**	**£3.15**
Bomber	**£3.95**	**£3.15**
Paintmaze	**£3.95**	**£3.15**
ZX Chess	**£6.50**	**£5.20**
Breakout	**£3.95**	**£3.15**
Space Invaders	**£3.95**	**£3.15**
Asteroids	**£3.95**	**£3.15**
Tempest	**£3.95**	**£3.15**
1K Gamespack	**£3.95**	**£3.15**
Debug	**£3.95**	**£3.15**

Business prices cut

As usual, we are making two special offers and this month we have been able to obtain a special price on some of the best games software on the market. Mikro-gen **Chess** and **Scramble** are both highly-rated cassettes and we have been able to obtain a discount of 20 percent on them and the rest of the company's range.

Sinclair has it covered

ALL THE cassette newsletters being sent to members now have a picture of Clive Sinclair on the cover. That is the result of a program sent by one of the members, M Scott of Gateshead, Tyne-and-Wear.

The program to print Clive's face was adapted from the entry from Scott, one of the oldest members of the growing Sinclair User Club. It was one of an increasing number of programs being sent by members.

The printout of Clive is now likely to be on all the newsletters, which are sent every two months to keep everyone in the User Club up-to-date on what is happening, both in the club and the world of Sinclair computers.

The latest cassette in-

continued on page 10

MEMBERSHIP FORM

I wish to join the Sinclair User Club and enclose my subscription of £12

Name ....

Address ....

....

....

....

Which computer do you own?

ZX-81 ☐ Spectrum ☐

Send your coupons to Sinclair User Club, ECC Publications, 30-31 Islington Green, London N1 8BJ. Cheques should be made payable to Sinclair User Club.

The Sinclair User Club

continued from page 9

cludes another instalment of the course for learning machine code, as well as programs and news. There is also the special telephone number for the problem-answering service which members can ring at any time for expert advice on difficulties they may be having. As readers of *Sinclair User*, in increasing numbers, are learning, there are many advantages to be gained by being a member of the User Club.

Apart from the cassette newsletter, they include regular discounts on a wide range of hardware and software. Each month there is a special offer. In the last few months it has included a reduction in the prices of most of the leading games programs on the market, the Kempston Klik keyboard and the full range of Thurnall Electronics add-ons.

This month's offer can be seen on the preceding page.

The club also offers a service to help with the loading and saving of tapes. Many of the problems arise from tape heads being wrongly-aligned. We are able to offer, for a nominal cost of £5, to re-align members' cassette heads. Further details can be obtained from the Sinclair User Club.

The activities of the club are also dealt with each month in the special club pages. To take advantage of all the benefits, complete the application form.

Britain

Aylesbury ZX Computer Club: Ken Knight, 22 Mount Street Aylesbury (5181 or 630867). Meetings: first Wednesday and third Thursday of the month.

Doncaster and District Micro Club: John Woods, 60 Dundas Road, Wheatley, Doncaster DN2 4DR; (0302) 29357.

Edinburgh ZX Users' Club: J. Palmer (031 661 3183) or K Mitchell (031 334 8483). Meetings: second Wednesday of the month at Claremont Hotel.

EZUG-Educational ZX-80/81 Users' Group: Eric Deeson, Highgate School, Birmingham B12 9DS.

Furness Computer Club: R J C Wade, 67 Sands Road, Ulverston, Cumbria (Ulverton 55068). Meets every other week on Wednesday evenings.

Glasgow ZX-80/81 Users' Club: Ian Watt, 107 Greenwood Road, Clarkston, Glasgow G76 7LW (041 638 1241). Meetings: second and fourth monday of each month.

Hassocks ZX Micro User Club, Sussex: Paul King (Hassocks 4530).

Inverclyde ZX-81 Users' Club: Robert Watt, 9 St. John's Road, Gourock, Renfrewshire, PA19 1PL (Gourock 39967). Meetings: Every other week on Monday at Greenock Society of the Deaf, Kelly Street, Greenock.

Keighley Computer Club: Colin Price, Redholt, Ingrow, Keighley (603133).

Merseyside Co-op ZX Users' Group: Keith Driscoll, 53 Melville Road, Bootle, Merseyside L20 6NE; 051-922 3163.

National ZX-80 and ZX81 Users' Club: 44-46 Earls Court Road, London W8 6EJ.

North Hertfordshire Home Computer Club: R Crutchfield, 2 Durham Road, Stevenage; Meetings: first Friday of the month at the Settlement, Nevells Road, Letchworth.

North London Hobby Computer Club: ZX users' group meets at North London Polytechnic, Holloway Road, London N7 each Monday, 6pm.

Nottingham Microcomputer Club: ZX-80/81 users' group, G E Basford, 9 Holme Close, The Pastures, Woodborough, Nottingham.

Orpington Computer Club: Roger Pyatt, 23 Arundel Drive, Orpington, Kent, (Orpington 20281).

Perth and District Amateur Computer Society: Alastair MacPherson, 154 Oakbank Road, Perth PH1 1HA (29633). Meetings: third Tuesday of each month at Hunters Lodge Motel, Bankfoot.

Scunthorpe ZX Club: C P Hazelton, 26 Rilestone Place, Bottesford, Scunthorpe; (0724 63466).

Sheffield: Andrew Moore, 1 Ketton Avenue, Sheffield S8 8PA would like people interested in starting a club in the area to contact him enclosing a stamped-addressed envelope for details.

Sittingbourne: Anurag Vidyarthi (0795 73149). Would be interested to hear from anyone who wants to start a club near the Medway towns.

Swindon ZX Computer Club: Andrew Bartlett, 47 Grosvenor Road, Swindon, Wilts SN1 4LT; (0793) 3077. Monthly meetings and software library.

Thames Valley ZX Users' Club: Richard Shepherd, 22 Green Leys, Maidenhead, Berkshire SL6 7EZ; (0628) 21107 (evenings and weekends). Hopes to start meetings on a regular basis.

Worle Computer Club: S W Rabone, 18 Castle Road, Worle, Weston-super-Mare BS22 9JW (Weston-super-Mare 513068). Meetings: Woodsprings Inn, Worle, on alternate Mondays.

ZX-Aid: Conrad Roe, 25 Cherry Tree Avenue, Walsall WS5 4LH (Walsall 25465). Please include sae. Meetings twice monthly.

ZX Guaranteed: G A Bobker, 29 Chadderton Drive, Unsworth, Bury, Lancashire. Exchanges information and programs throughout the country.

ZX-80/ZX81 Users' Club: PO Box 159, Kingston-on-Thames. A postal club.

Overseas

Belgium, France, Luxembourg: Club Sinclair, Raymond Betz, 38 Chemin du Moulin 38, B-1328 Ohain, Belgium (322 6537468)

Belgium, Netherlands: Microcomputer Vereniging BZW, Paul Glenisson, Priester de l'Epéestraat 14, B-1200 Brussels, Belgium (322 7349954)

Denmark: Danmarks National ZX-80/81 Klub (DNZK), Jens Larson, Skovmosevej 6.4200 Slagelese, post giro 1 46 24 66.

ZX-Brugergruppen i Danmark, Boks 44, 2650 Hvidovre. Gratis medlemskab og gratis blad til enhver interesseret.

East Netherlands: Jonathon Meyer, Van Spaen Straat 22,6524 H.N. Nijmegen; (080 223411).

Germany: ZX-80 Club, a postal club; contact Thomas Jenczyk. Hameln, Postfach 65 D-3250 Hameln, Germany.

Indonesia: Jakarta ZX-80/81 Users' Club, J.S. Wijaya, Jakarta, Indonesia.

Republic of Ireland: Irish ZX-80/81 Users' Club, 73 Cnoc Crionain, Baile Atha, Cliath 1.

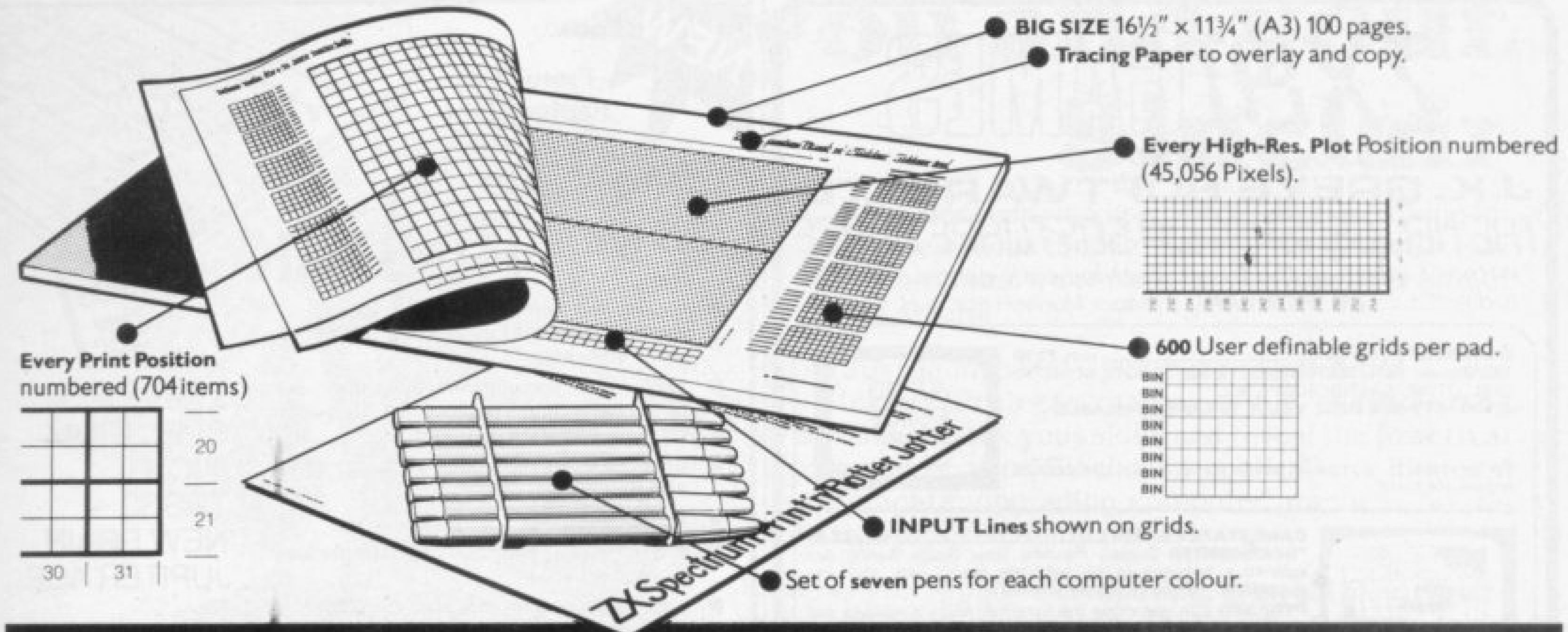
Singapore: Sinclair Users' Group: Eric Mortimer, 1D Wilmer Court, Leonie Hill Road, Singapore.

South Africa: Johannesburg ZX80/81 Computer Users' Club: S Lucas, c/o Hoechst SA (Pty) Ltd, PO Box 8692, Johannesburg. Teaches Basic and machine code, interest in hardware.

Johannesburg ZX Users' Club: Lënnërt ER Fisher, PO Box 61446, Marshallstown, Johannesburg.

Spain: Club Nacional de Usuarios del ZX-81, Joseph-Oriol Tomas, Avda. de Madrid, No 203 207, 10, 3a esc. A Barcelona-14 Espana. International ZX Spectrum Club: Gabriel Indalecio Cano, Sardana, 4 atrico 2a, San Andres de la Barca, Barcelona. Send international reply coupon. Produces a bi-monthly magazine.

United States: Bay Area ZX-80 User Group, 2660 Las Aromas, Oakland CA94611. — Harvard Group, Bolton Road, Harvard MA 01451; (617 456 3967).



It will improve your ZX SPECTRUM graphics in ways you wouldn't believe possible.

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That's why we have packed the new Spectrum Print 'n' Plotter Jotter with every facility to exploit your graphics to the full.

After the first few weeks of "playing" with your computer you will want to get down to serious programming and planning in which professional-looking graphics should play a major part.

What better way to work it out than with a Print 'n' Plotter Jotter?

The professional pad

Print 'n' Plotter is not just another programming pad.

Just look at the specifications:

BIG SIZE 16½" x 11¾". 100 Pages — 50 Print Grids and 50 High Resolution Plot Grids.

Printed on high-quality tracing paper, enabling you to overlay the pages for direct co-ordination between PRINT and PLOT or to copy from illustrations, maps, charts, photos etc.

PRINT Grids show all numbered co-ordinates for the 704 screen positions, plus INPUT lines.

PLOT Grids show every numbered co-ordinate for the 45,056 Pixels!

Each pad contains 600 user-definable grids for use with the BIN n, POKE USR "a" function.

And the whole thing is fully bound with fly leaf cover and complete with a set of seven colour pens!

The simple way to get serious

Spectrum Graphics can become very complex, so before you start to program the best way is to work it out on a Print 'n' Plotter and save all those errors!

Take for instance the common CIRCLE. With a Jotter you can establish the exact screen location for the centre in seconds, and it will stop you running out of screen because of a too large radius. Working our DRAW is similar: pre-determine DRAW lines and PLOT positions before you start. With a Jotter you can build-up graphics using every facility with a direct co-ordination between each.

For instance, correct PLOT OVER or PRINT OVER positions will be easy with a Jotter.

See the show for just 95p!

To demonstrate the graphic possibilities with the SPECTRUM JOTTER we have produced a cassette-based Demonstration program for only 95 p (inc VAT and P&P). Why not send for a copy, or order it together with your JOTTER?

Just part of a range of ZX products

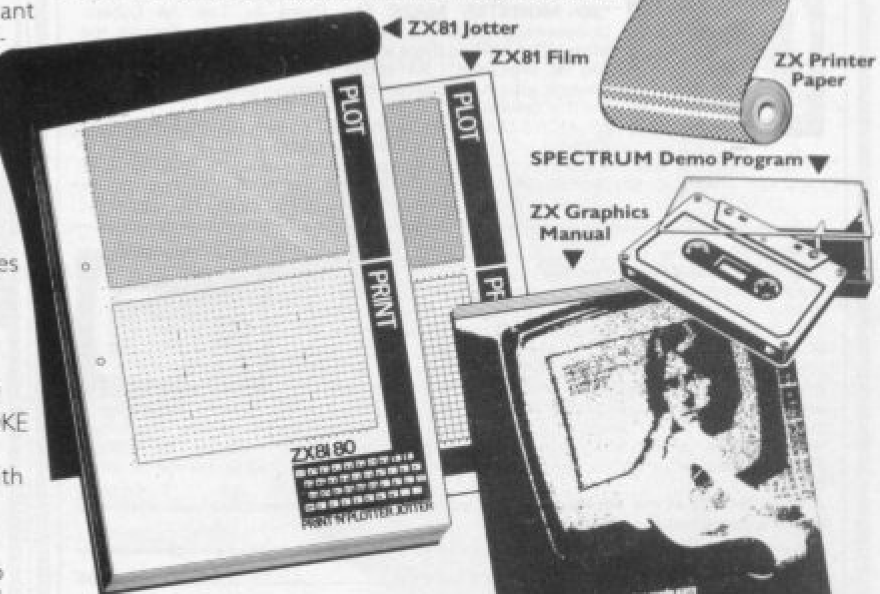
The Spectrum Jotter is, of course, an upgraded version of our popular *ZX81 Print 'n' Plotter Jotter and Film*. For ZX81 owners these are available by direct mail or through a growing number of retailers and compshops.

The ZX81 Jotter is a 100 page Graphics pad that exploits to the full the graphics facilities of that micro. ZX81 Film is a matt film version of the Jotter which is re-usable and ideal for 'copying' graphics.

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ZX81 GAMES

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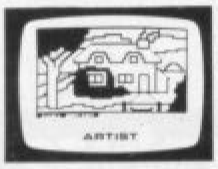
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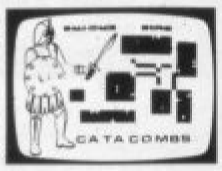


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A SMASH HIT at the ZX Microfair (most of the other software houses wanted a copy), a game not to be missed!





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adapt electronics

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Q. What is 'wobbly rampack'?

A. Ask Sinclair Users. They will tell you about the programs they have lost due to intermittent loss of memory connection resulting in a program 'crash'.

Oxidation of the tin-plated edge connector is the root cause of the problem. The lack of mechanical attachment between the Rampack and the Computer aggravates this condition. Slightest movement of the rampack can cause a program crash. Improvement of the Rampack case design will not completely cure the problem.

RAMLOK kit from ADAPT Electronics provides the complete cure.

The kit replaces the tinned connector with a reliable high quality gold-plated version and provides an ingenious simple mechanical clamping device which clamps the Rampack to the Computer but is simple and easily released.

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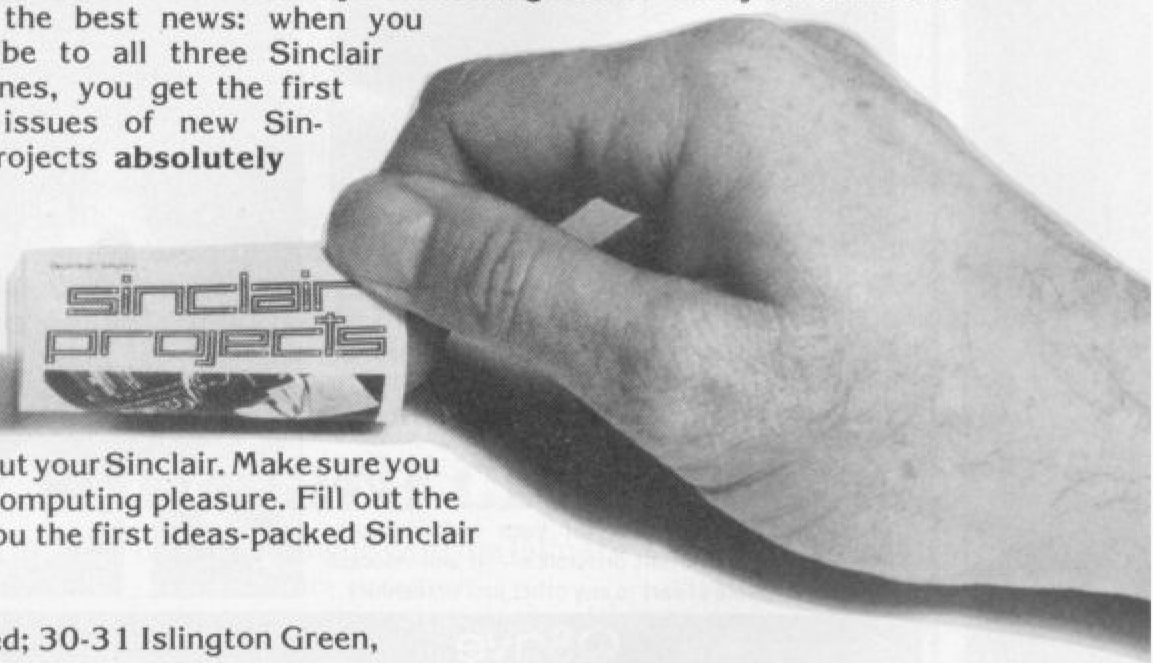
Because we know you're always looking for new ideas to make the most of your Sinclair computer, we're making sure you never run out of steam!

Just launched — and out in December — was **Sinclair Projects** magazine, full of fascinating schemes to tax your skills and reveal the **practical** potential of your Sinclair in applications like controlling lights, upgrading computer graphics, household security, and many more.

Whether you're new to computing, or an old hand, you're certain to be an enthusiast. That's why we introduced **Sinclair User** magazine for the latest news, techniques and enhancements to **match** your enthusiasm (now with new 'Spectrum User' supplement!) Next, its companion magazine, **Sinclair Programs**, became an overnight success with 40 NEW programs, ready for you to key, in every issue.

Now the exciting new Sinclair Projects completes your store of possibilities with a huge increase in computing potential for you to explore.

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Krazy Kong £3.95

All machine code version of the popular arcade game. This program has all the features of the original and is every bit as fast.

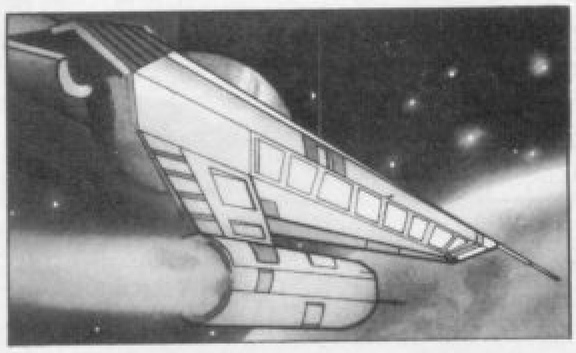
Ghost Hunt 3.95

Gobble you way through a Maze- Ghosts, power pills etc etc. very fast.

Maze Drag Race 3.95

Drive through a giant maze 9 times the size of the screen picking up points as you go – but watch out for the other cars, rocks oil & ice. A really superb M/C game.



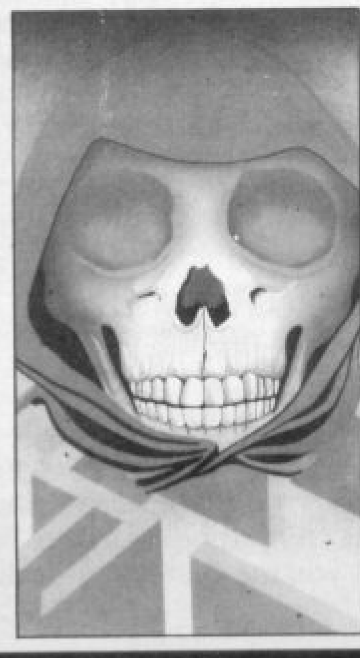


Alien 3.95

Set on board the spaceship Nostrodamus, can you choose the right weapon to repel the alien before he kills your crew?

DCoder 5.95

Essentially a disassembler for your machine code but with one important difference – it will relocate the code in whole or part to any other part of memory.



Zonix 12.95

Sound effects for your ZX81 are now available at a price you can afford! Zonix is a hardware/software combination that allows you to write programs with real impact. The software includes two programs:

a) A program set to produce bombs, missiles, fire engines, tunes, telephones and sirens. Also includes the facility to make your own.

b) A program that turns your ZX81 into an electronic organ.

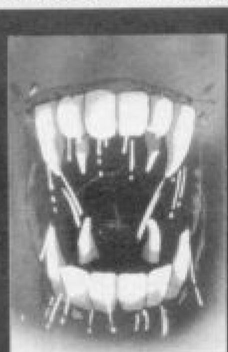
The hardware is an amplifier with volume control and loudspeaker which simply plugs into the mic socket of your ZX81. The sounds can be actuated from within your programs with a simple command. They can also be of various lengths so the limit is only your own imagination.

MCoder £7.95

This truly amazing program is the most flexible compiler available for the ZX81 AND NOW THE SPECTRUM TOO!.

MCoder will instantly translate your slow basic programs into super fast machine code at the touch of a key. It is also extremely easy to use: just load MCoder (the ZX81 version is just 2K long, the spectrum versions 3K) and then write your basic program as normal or you can load a basic program from tape to save you retyping the whole thing. MCoder then allows you to run and debug the basic until it is fault free. Now you can bring MCoder into operation using a print USR command – the basic will then be compiled into machine code as you watch!.

On average MCoder will increase the speed of basic programs 75 times. Both the ZX81 and the spectrum version will handle 95% of all basic commands and is quite simply the best compiler on the market. Please state whether 16K or 48K when ordering the spectrum MCoder.



QSave £15.95

MANY THOUSANDS OF SATISFIED CUSTOMERS NOW HAVE A HIGHLY RELIABLE LOADING SYSTEM WHICH OPERATES 16 TIMES FASTER THAN THE SINCLAIR SYSTEM'

The news is that QSAVE has been improved for '83

This is what you get:

1. A cassette interface to improve the signal quality (essential if a high speed loader is to be reliable) which will also improve the loading of your programs. The interface plugs into your ZX81 using the leads supplied and has been improved to incorporate: AN AUTOMATIC LEVEL CONTROL....AN OVERLOAD WARNING LIGHT....A SAVE/LOAD SWITCH (no unplugging of mic or earphone leads)....AN ON/OFF SWITCH (which doubles as a Reset switch). With these features loading is highly reliable (programs will still load with a volume setting as LOW as ¼).

2. Highly sophisticated software which will load and Save programs at 16 times their normal speed (i.e. 8K in 10 secs; 48K in 110 secs). Programs can be named to allow a superfast file search through a tape. It works equally well with autorun programs, Basic or machine code.

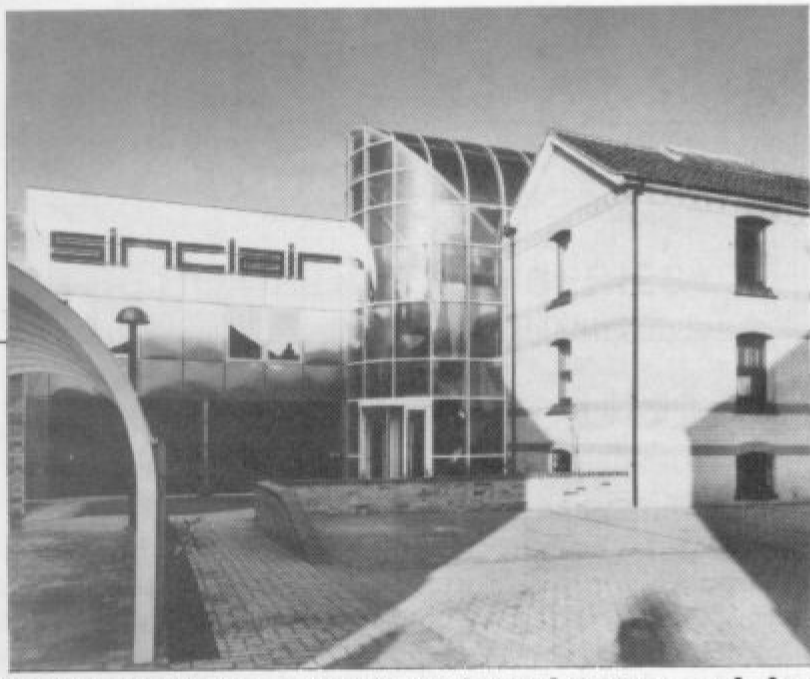
A **TRUE** verify feature is also provided – this allows you to verify that a 'SAVE'd program has 'SAVE'd properly **BEFORE** turning off the power and finding all is lost.

QSAVE will operate with **ANY** memory, on **ANY** program length **AND** with your existing programs.

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THE COMPUTER DIVISION of Sinclair Research has moved into new premises at Willis Road, Cambridge (above). An old factory, part of which can be seen on the right of the picture, has been completely refurbished.

It is the first time both sections of the division — research and development and marketing — have been together on one site. The factory was bought in the autumn of 1981 and improvement work has been going on since then.



Spectrum goes on retail sale

THE SPECTRUM is now being sold over the counter in 65 major branches of W H Smith. Sales areas include Manchester, Birmingham and south-east London.

It was introduced into Smiths at the beginning of December and John Rowland, market development manager, is optimistic about the new addition to the Smith computer range.

"We are selling the Spectrum on a permanent basis and we would like to sell periphals for the Spectrum when, and if, they arrive," he says.

"We are also selling the Sinclair range of software to support the Spectrum and this is expanding all the time."

The Smith move into selling the Spectrum has not slackened demand for the ZX-81 and its software. "We were surprised by the continuing demand for the ZX-81. Sales figures are on a level with this time last year," he says.

Smith's range of software now comprises more than 40 titles for the Spectrum and ZX-81. The company is also starting to sell accessories and books for both machines.

Healthy move by young software house

SINCLAIR computers are moving into the health market. A series of programs has been launched by Eastmead Computer Systems intended to educate and advise on a comprehensive range of medical topics.

The series is not intended to replace professional advice but to complement it by teaching people about preventative techniques and how to cope with problems when they arise. It is hoped that people will be encouraged to seek medical advice in cases when they might otherwise have delayed.

Two of the cassettes have been available for the ZX-81 since before Christmas. They deal with basic medicine and a simple screening system. There are plans to issue them later for the Spectrum.

The series is based on the writings of Dr Vernon Coleman, author of a number of books and articles on the subject.

Fiction prize awarded

THE FIRST Sinclair Prize for Fiction has been won by Hilda Berntein for her novel based on her experience of political conflict in South Africa. She will receive £5,000 and *Death is Part of the Process* is to be published soon by Sinclair Browne, the publishing house formed by Clive Sinclair and Patrick Browne in 1981.

Sinclair Research sponsored the prize for unpublished work to encourage "high-quality writing with contemporary social and political relevance". After its success in the first year it is intended to continue with the award, which the company is confident will become a major feature of the literary scene.

It is part of the company's sponsorship of the arts which involves the support of many groups.

New software club plans

A NEW CLUB has been formed in the U.S. for owners of the TS-1000, the American equivalent of the ZX-81. The Run-it Software Club is described by one of its organisers, Gayle Morse, as a program-of-the-month club. If the software which it presents is received well in the States, the club may also expand to cover the British market. Morse says:

"The club was conceived last August. We did some test marketing in November and December and launched our first catalogue with the January feature program".

That program deals with buying and selling property which Run-it has priced at $10.95. The suggested retail price is $16.95 and the regular Run-it price is $14.95.

The Real Estate Advisor is just one sample of the quality of software which Run-it wants to market in the coming months. "Run-it programs all feature professional-level programming and clearly-written manuals," the company says.

Regular selections in the catalogue will have 10 and 20 percent discounts each month but the Run-it feature programs will be priced at 30 or 40 percent off retail. The programs are written by a combination of staff and outside programmers.

Individual orders from Britain are welcome and further information can be obtained from Run-it Software Inc, 732 South Sherman, Chicago, Illinois 60605.



Import decision awaited

A FINAL decision is still awaited on the demand for a year's ban on the import of microcomputers into Britain. The plea was made by a group of British micro manufacturers in a letter to the Prime Minister. An acknowledgment has been received and the manufacturers are now waiting to see if there will be any action.

The firms, known collectively as the British Microcomputer Manufacturers Group, are worried that imports could cause the British industry to be still-born.

Although Sinclair Research is a member of the group, it has criticised the import ban call as being unhelpful. It would be better to dismantle controls which inhibited the growth of the British industry.

It is understood that officers of the BMMG are seeking a meeting with Clive Sinclair to try to resolve the differences.

The thinking Hobbit

ARTIFICIAL intelligence has reached the Spectrum, according to Nigel Searle, head of Sinclair Research computer division. Searle was talking about **The Hobbit**, a new 48K adventure game from Melbourne House.

Artificial intelligence gives a computer the ability to communicate with a user as if it had not been programmed to do so. In the case of The Hobbit, artificial intelligence is exhibited by the characters in the adventure which seem to act out normal lives which do not depend on how the player moves.

The Hobbit forms part of a new line of Spectrum software sold by Sinclair Research. Other titles include Adventures A, B and C

Getting away for a good start

A RESIDENTIAL weekend course has been started for new owners of the ZX-81 who are having difficulty with the official manual. The course, at the Gainsborough House Hotel, Kidderminster, costs £55 and includes full bed and board. There is accommodation for 20 people on each course and there is 15 hours of hands-on experience on one of the hotel's 20 ZX-81s.

Further information about the courses can be obtained from Christoper Dale, Gainsborough House Hotel, Bewdley Hill, Kidderminster DY11 6BS.

ZX-81

THE HOME DOCTOR SERIES

Exciting Breakthrough In Home Health Advice

Announcing the launch of a series of computer programs designed to educate and advise on a comprehensive range of medical topics whilst being FUN to use.

The text has been prepared by Dr Vernon Coleman who writes from 10 years experience in a busy general practice, and who is widely acclaimed for his many books on medical topics.

The cassettes in the series cover the following topics:

1. Basic Medicine
2. Mainly for Women
3. Mainly for Men
4. All About Children
5. How Healthy Are You?
6. 101 Home Nursing Tips

The computer programs are not intended to replace professional medical advice but rather to complement this by educating users on preventitive medicine and how to cope with medical problems when they arise. The programs would therefore be equally useful in schools, homes and in industrial applications as part of health screening programs.

Each cassette costs £6.75 plus £0.45 postage and packing although as a special offer to Micro Decision readers all 6 cassettes are available for £35.75 post free.

Users should indicate whether the cassettes are for VIC 20 or ZX81. VIC 20 owners require a 3K or 8K RAM pack and ZX81 owners require a 16K RAM pack to run all of the programs.

Please allow 28 days for delivery.

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ORBITER "Lightning reflexes are needed" - *E & C*. All m/code. 'Defender'- style program. Full arcade features as you kill the aliens with laser bolts and smart bombs (Silversoft). 16/48K SPECTRUM. £5.95.

SPECTRES "Latest twist in the maze game" - *CVG*. Help Eddie light up his mansion, outwit the 4 ghosts. Beautiful graphics, multi-level, on-screen score and freeze feature. (Bug-Byte). 16/48K SPECTRUM. £8.00.

TIMEGATE Breathtaking 4D adventure. Hi-speed graphics. "The best graphical game I have seen on any micro" - (Interface). FREE training program and keyboard overlay. Great. (Quicksilva). **48K only.** £6.95.

16K ZX81 ONLY ....

TRADER "Fantastic 48K graphic adventure...original and entertaining" - *S.U.* Loads in 3 x 16K chapters. Beautiful. (Pixel). £10.50.

FROGGER Addictive. Great graphics. Moving cars, logs, diving turtles, alligators - watch out for the snake! All m/code. On-screen score, hi-score, timing. Hall of fame. (DJL). £5.95.

PILOT Brilliant flight simulation, written by a pilot. 7 modes, including Autopilot demo. Learn to take-off, land, direction-find (Hewson). £5.95.

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FOR 48K SPECTRUM AND ZX81 16K ....

BLACK CRYSTAL More variety than any other Sinclair adventure. From the people who wrote 'Volcanic Dungeon'. 180K of Spectrum program loads in 6 chapters. Over 100K for ZX81 loads in 7 chapters. (Carnell). £7.50.

PIMANIA "An adventure enthusiast's dream" - *CVG*. And you may win the £6,000 Golden Sundial of PI. Best use of music and graphics we've seen for the Spectrum. Brilliant on ZX81. (Automata). Spectrum, £10.00. 16K ZX81, £8.00.

CHESS "The standard for ZX chess" - *ZX Comp*. 7 play levels, all legal moves, position analysis, recommended move option. Spectrum version has beautiful graphic chessmen. (Artic). Spectrum, £9.45. 16K ZX81, £9.95.

Please post to: Software Supermarket, 87 Howards Lane, London SW15 6NZ.

Please send me the following ....(No.) programs for my ZX81 16K/Spectrum 16K/Spectrum 48K.
I enclose my cheque/PO for £.......... made payable to Software Supermarket.

Name ....

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Please complete carefully in block capitals. If we can't read it, you won't get it. For 1 program, please add 50p p & p. 2 or more programs p & p free.
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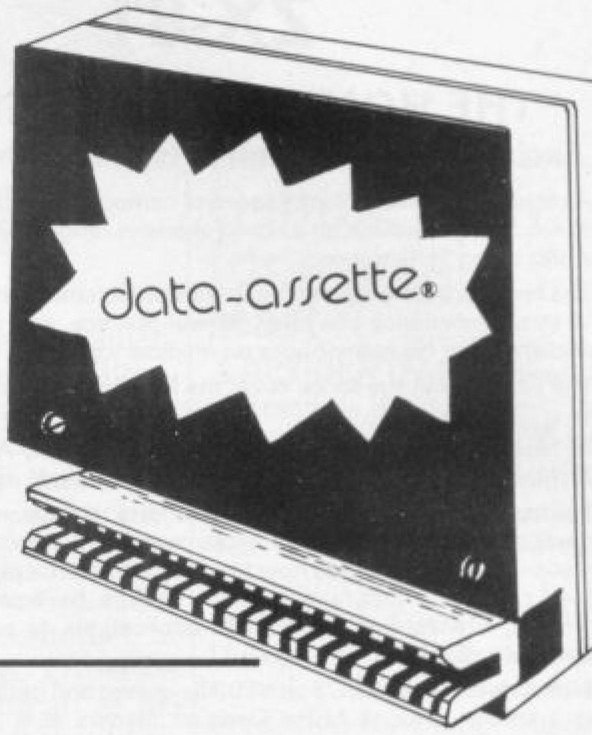
RAM PACKS

British made, high quality, add-on memory at affordable prices. Fully guaranteed.

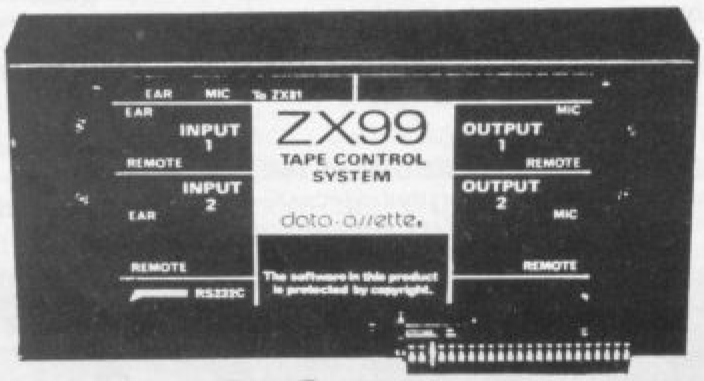
16k Ram Pack ———— **£28·95**

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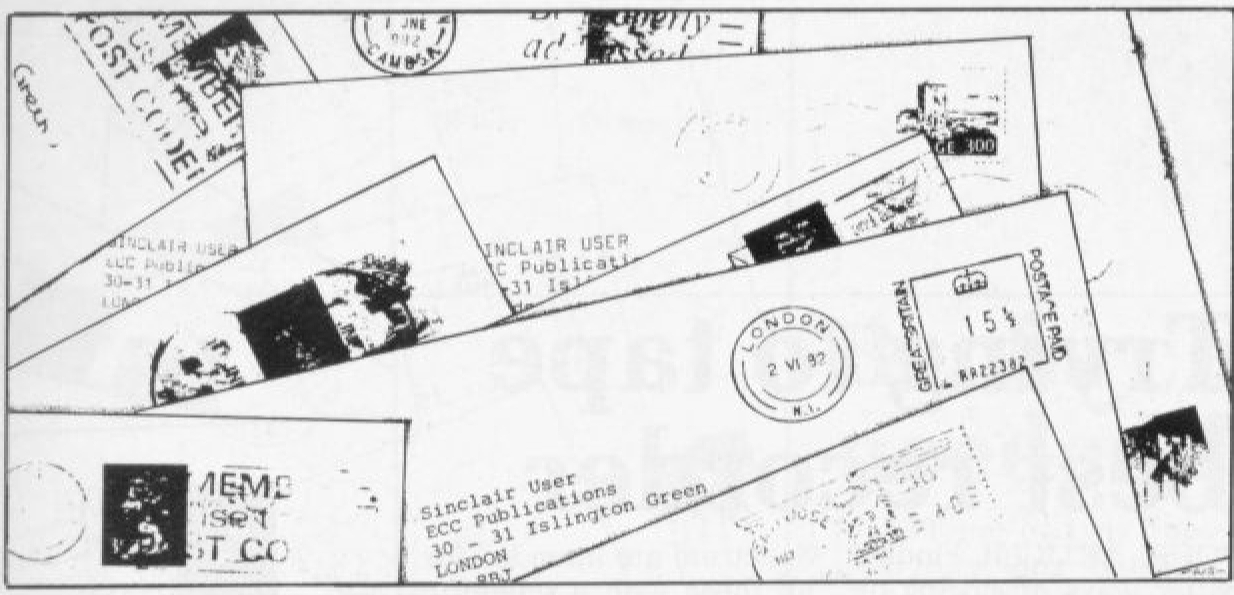
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P&P 10% (min. charge £1.50)

Charge my Access/Visa no: ____________

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Sinclair helps ensure a very busy retirement

I MUST gently remonstrate with Bill Martin and Sandra Mason for their somewhat dismissive and derogatory statement in your November issue that people over 60 years of age are unlikely to buy a microcomputer.

I am 67½ and my son bought a ZX-81 about 18 months ago. In July he bought another computer and gave the ZX-81 to me.

I became addicted and when, about six weeks ago, the ZX-81 developed a fault — it got stuck in the red shift and the K intermittently changes to F — I ordered a new Spectrum, with which I now play happily.



If anyone can tell me how I can rectify cheaply the fault on the ZX-81 I shall be very grateful, as I can then pass it to another potential addict. There are surely a number of people my age who have found in microcomputers an absorbing hobby for retirement.

Incidentally, I agree with your correspondent K Watson that programs in *Sinclair User* and *Sinclair Programs* are frequently poorly printed and unusable. Please remember that people capable of deciphering poor print are adept enough to write their own programs. I have a number of books of programs for ZX-81, which are printed normally, so why cannot you do the same and help us oldsters?

E W Ansell,
Cowes, IoW.

I FEEL I must refute the opinion of Messrs Martin and Mason — Futurology, September — that householders over 60 years old are too mean to buy a computer costing more than £10. I know of at least three in Caernarvon who are Sinclair users. I have a Spectrum and two are on the waiting list. Or perhaps they think we are too old to understand them? We may be slower but we get there in the end.

Reference Promises, Promises. My enquiries to Sinclair have been promptly and politely answered, both by sales and technical departments, apart from late delivery, I have no complaints.

F Smalley,
Llanfaglan,
Caernarvon.

Non-wobble solution

HERE IS an idea to stop RAM pack wobble on the ZX-81. Simply stick the RAM pack to the computer with small pieces of Velcro fastening tape placed between the two units. It also works with the memopack.

Trevor Neale,
Folkestone, Kent.

Food for thought

I HAVE seen advertisements in your magazine and others regarding other programming languages for the ZX-81 and Spectrum. The Artic Computing software house with its ZX Forth at £35 is one example.

I have yet to see a review or assessment of their value or quality in any magazine. Your comments or a review or assessments would be much appreciated.

W E Rogers,
Dagenham, Essex.

THE SPECTRUM programming manual lists the Microdrive keywords but does not explain their use. Could you publish an article explaining how the Microdrives will operate.

P Bankes,
Debenham, Suffolk.

• *Thank you for your comments. All the suggestions are being considered for future articles.*

Spaced out with commas

I FIND that what the manual says — page 200 — is not what happens in practice with my ZX-81; for commas in print statements, the rules are:

Each comma causes a space to be printed at the print position in force immediately before the comma is acted on.

Each comma moves the print position to the next column 0 throwing a new line — or the next column 16. Here is a demonstration program:

```
10 FOR I=1 TO 64
20 PRINT "*";
30 NEXT I
40 PRINT AT 0,15,,,"O"
```

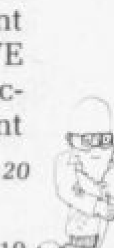
which shows that line 40 prints three spaces at (0,15) (0,16) (1,0) and 0 at (1,16).

W E Thomson,
Aldeburgh,
Suffolk.

Taking the MIC

AFTER many days spent vainly attempting to SAVE and/or verify on my Spectrum, using three different

continued on page 20





continued from page 19

cassette recorders, all of which would LOAD easily, I accidentally found a solution.

No matter whether I want to SAVE, VERIFY or LOAD, I ignore the MIC socket and always use the EAR socket with, of course, the EAR or MIC socket on the recorder. Success every time.

This is obviously contrary to the Spectrum instruction manual. Is my Spectrum faulty? Have many/any other Spectrum users had the same problem/solution?

S C Craxford,
Andover, Hampshire

•Sinclair Research says that the Spectrum probably has a faulty MIC socket and should be returned for replacement.

Spectrum amplified

I AM the owner of a Spectrum and am writing to inform you how powerful the Ear output of the Spectrum is. I have a monotone cassette recorder and I have found that if I connect a lead from the Spectrum Ear socket into the Ext Sp of my recorder, the sound is much amplified.

There is not only sound coming louder from the recorder but the computer sound, too.

When connecting the lead to the recorder, the jack plug should be pushed only halfway into the Ext Sp socket. Some fiddling may have to be done to achieve the amplification but the difference can easily be distinguished.

M Hawes,
Ely, Cambs.

Trying to tape best recorder

YOUR ARTICLE Finding better ways of storing on tape, October 1982, failed to provide a practical conclusion, i.e., a list of approved or recommended cassette recorders. If washing machine manufacturers can recommend washing powders, surely computer manufactures can provide a similar service on cassette recorders?

I particularly wish to know whether a Philips D6310 cassette recorder is compatible with the ZX Spectrum which I am pationtly waiting to receive.

P D Curle,
Kings Lynn,
Norfolk.

•We did not give a list as it is impossible to test all the recorders on the market and so any list would inevitably exclude ones which worked and include others which, because of the reasons expressed in the article, might not work in a particular instance. Sinclair Research informs us that its engineers have yet to find a machine with a 3.5mm. jack, MIC and EAR sockets which does not work with the Spectrum.

Ephemeris put right

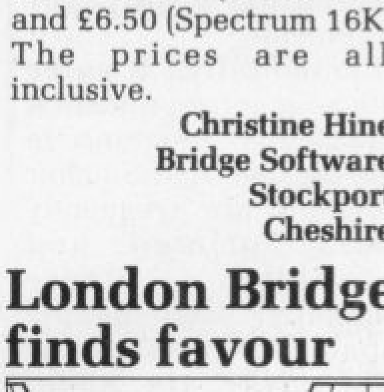
THANK YOU for printing reviews of our Ephemeris and Lynchmob programs in your superb Christmas number. May we ask you to publish this letter to correct two slight errors?.

Our Ephemeris programs for the ZX-81 and Spectrum are intended for all those with a scientific interest in the solar system and will appeal to amateur astronomers rather than astrologers. The prices of the programs are £6.90 for the ZX-81 version and £7.90 for the Spectrum version.

Our fun educational game of Lynchmob is priced at £4.95 (ZX-81 16K) and £6.50 (Spectrum 16K). The prices are all-inclusive.

Christine Hine,
Bridge Software,
Stockport,
Cheshire.

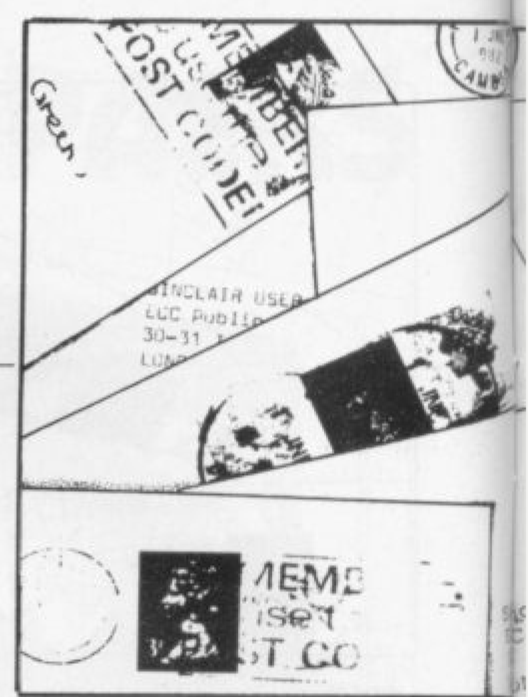
London Bridge finds favour



THANK YOU for the London Bridge program in the Christmas edition. It was lovely. I beat your score of 1,700 by scoring 2,050. There was one brick left when I fell in to the water. I am only eight years old. Has anyone beaten my new high score?.

I also like Phasor when the alien hits you.

Owen Nurse,
Cambridge.



Games not for sale

I WOULD appreciate it if you would publish a retraction of a review you did a few months ago of a collection of my games sent to you for publication. It implied that I could supply the cassettes commercially which I cannot do.

I am still receiving orders and it is costing me a good deal of money to return cheques and explain the situation.

D E Healey,
63 Cedar Avenue,
Coseley,
West Midlands.

Bug feared in Spectrum

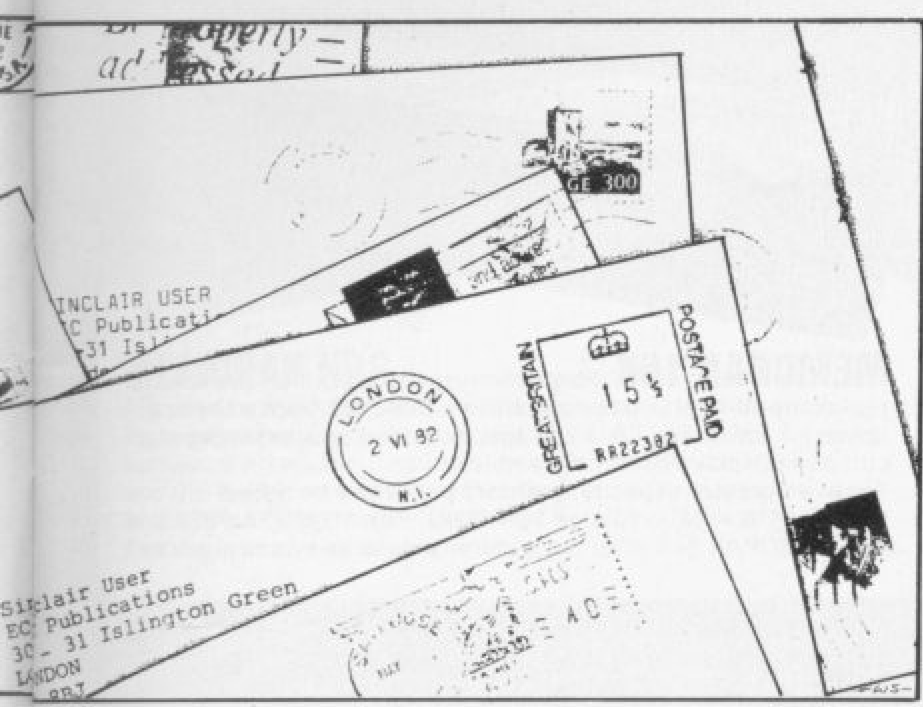
I OWN a Spectrum on which I seem to have discovered a bug. I would be interested to know if other readers have reported any problem, since I cannot get a reply from Sinclair on the matter.

The INKEY $ function does not appear to work correctly. e.g.,

```
10 Pause O: Let i$ +
   INKEY $
20 If i$ = "a" then . . .
30 If i$ = "b" then . . .
```

The above fails to run past the INKEY $ statement.

Similar pieces of program, for example in the "Draw" program on the Horizons pack, also crash



the program. Replacing the above with:

10 Poke 23560, 0 (sys. variable — last key)
20 Pause O; Let i$ = CHR$ PEEK 23560 . . .
works fine.

Do I have a ROM bug?

M Adcock,
Braintree, Essex.

•*According to a Sinclair Research spokes man, you do not have a bug. He adds that Pause 0 will wait until a key is pressed.*

Program shortage

I WISH to complain at the lack of Spectrum programs in December in your Program Printout. I know that some of the programs listed can run on the Spectrum with some modifications but that is beside the point. Your publication is normally very good but should cater for all Sinclair users every month, in articles and programs.

I was sorry to see *Spectrum User* absorbed into the main body of the magazine but concede to your reasons.

Your software reviews are excellent but I think you could do with a little more in-depth hardware reviews, i.e., comparative merits of 10 types of RAM or keyboard, for example.

Nicholas Wright,
Leicester.

• *We apologise for the lack of Spectrum programs in the December issue, due to an oversight. We had, however, a number of articles of interest to Spectrum owners, including a review of the Sinclair range of software. We acknowledge your comments about possible reviews and will bear them in mind.*

Printer fumes harm query

CAN YOU tell me if there are any harmful effects from breathing the fumes given off by the Sinclair printer?

P Matthews,
Hampstead, NW3.

•*None of which we are aware.*

Bachs chord skill needed for keys

I HAVE not had my Spectrum very long. It is still having teething troubles with me but one thing is already obvious — that the approach to the keyboard has to be not that of a touch-typist, but rather of an organist with all J S Bach's skill in playing chords.

How he would have appreciated the power of this great little four-decker instrument, though I suspect that he would have had two shift tabs brought out under his thumbs.

C R Oswin,
Christchurch, Dorset.

Sufferers' club donation plea

I HAVE just read the November issue of *Sinclair User*, in particular the latest batch of letters from members of the Sinclair Sufferers' Club. As an early sufferer myself, I felt moved to make an observation which might benefit Uncle Clive.

As the average member of SSC has to wait in the region of three months before receiving an order, would it not be a good idea to invest all that money for three months and donate the interest to a well-known charity?

Also bearing in mind the number of complaints you have received about delays of Sinclair products does anyone know of a case where the company managed to deliver within 28 days?

R Whitehead,
Odiham, Hampshire.

Identity problem

FOR EIGHT weeks Oxford Computer Publishing has been advertising in *Sinclair User* Machine Code Test Tools and inviting orders to PO Box 99, Oxford. The dymostickers identifying customers of Box 99 at Oxford Post Office fell from the boxes, according to the Post Office, and OCP orders were sent to the previous owner of Box 99.

OCP therefore is appealing to customers, with apologies, to persevere and to telephone orders to its office address, 0753 888866, or to post orders to 4 High Street, Chalfont St. Peter, Bucks SL9 9QB.

B N Richardson,
Director
Oxford Computer Publishining.

Code sexists rule

WHILE READING the article on code junkies — December, 1982 issue — my enjoyment was dampened once more by the assumption that only young males are now striving at school, Scouts and in cricket clubs to gain the



social experience to fit them for a sparkling career in computing.

My children, a girl and a boy, buy this magazine between them each month and they are equally interested in computers, mathematics, the *Beano*, Scouts/Guides, netball/cricket. When my daughter reads this article once again she will get the message — boys only. From Ladybird books to *Sinclair User*, the meaning seems to be clear. Sad?

J E M Fradgley,
Stratford-upon-Avon,
Warwickshire.



MEMOPAK 16K For those just setting out on the road to real computing, this pack transforms the ZX81 from a toy to a powerful computer. Data storage, extended programming and complex displays become feasible.
For even greater capacity, memory packs can be added together (16 + 16 + 16K or 16 + 32K). The MEMOPAK 32K and the MEMOPAK 64K offer large memories at economical prices.

MEMOTECH

The Memotech approach to microcomputing is to take the well-proven and popular ZX81 as the heart of a modular system. This small computer houses the powerful Z80A processing unit and acts as the central processor module through which the MEMOPAKS operate.

Memotech has a reputation for professional quality, producing units which are designed to fit perfectly, to look well-balanced, and to work efficiently and reliably.

The modular approach gives ZX81 owners the freedom to design the system they really need. Furthermore, the intercompatibility of the modules ensures that later additions will click straight in, to give you a system that grows with your ambitions and abilities.

As one example, a system with 16K of memory and MEMOCALC is all that is required to perform sophisticated numerical calculations giving the same results as a computer at 10 times the price. The problem may be as complicated as a cash flow or production schedule, or as simple as household accounts or pocket money budgeting. If the bank manager wants to see the cash flow, then a single print instruction to the Centronics I/F will give a printout which is more than acceptable to any bank.

The example system which is shown, on the other hand, would satisfy the needs of someone who wanted to enter data via a light-touch keyboard, construct and label graphs, and then copy the screen to an 80-column printer. Only 16K of memory is used here but with additional memory, more than one video page can be stored. Up to 7 successive pages can be displayed cyclicly to give animated displays.

MEMOCALC The screen display behaves as a 'window' on a large sheet of paper on which a table of numbers is laid out. The maximum size of the table is determined by the memory capacity, and with a MEMOPAK 64K a table of up to 7000 numbers with up to 250 rows or 99 columns can be specified. Each location in the table can be either a number which is keyed in or a formula which generates a number. Every time the command to 'calculate' is given, all the formulae in the table are re-evaluated. Spreadsheet analysis started as an aid to cash-flow analysis, but this powerful tool has now been generalised and MEMOCALC with its special ability to perform iterative calculations is invaluable in the performance of numerical tasks.



16K	£26.00	+	£3.90	VAT	£29.90
32K	£43.43	+	£6.52	VAT	£49.95
64K	£68.70	+	£10.30	VAT	£79.00
HRG	£34.70	+	£5.20	VAT	£39.90
CI/F	£34.70	+	£5.20	VAT	£39.90
MEMOCALC	£26.00	+	£3.90	VAT	£29.90
Z80 ASSEMBLER	£26.00	+	£3.90	VAT	£29.90
KEYBOARD WITH BUFFER	£43.43	+	£6.52	VAT	£49.95

Memotech products are available at larger branches of WHSMITH

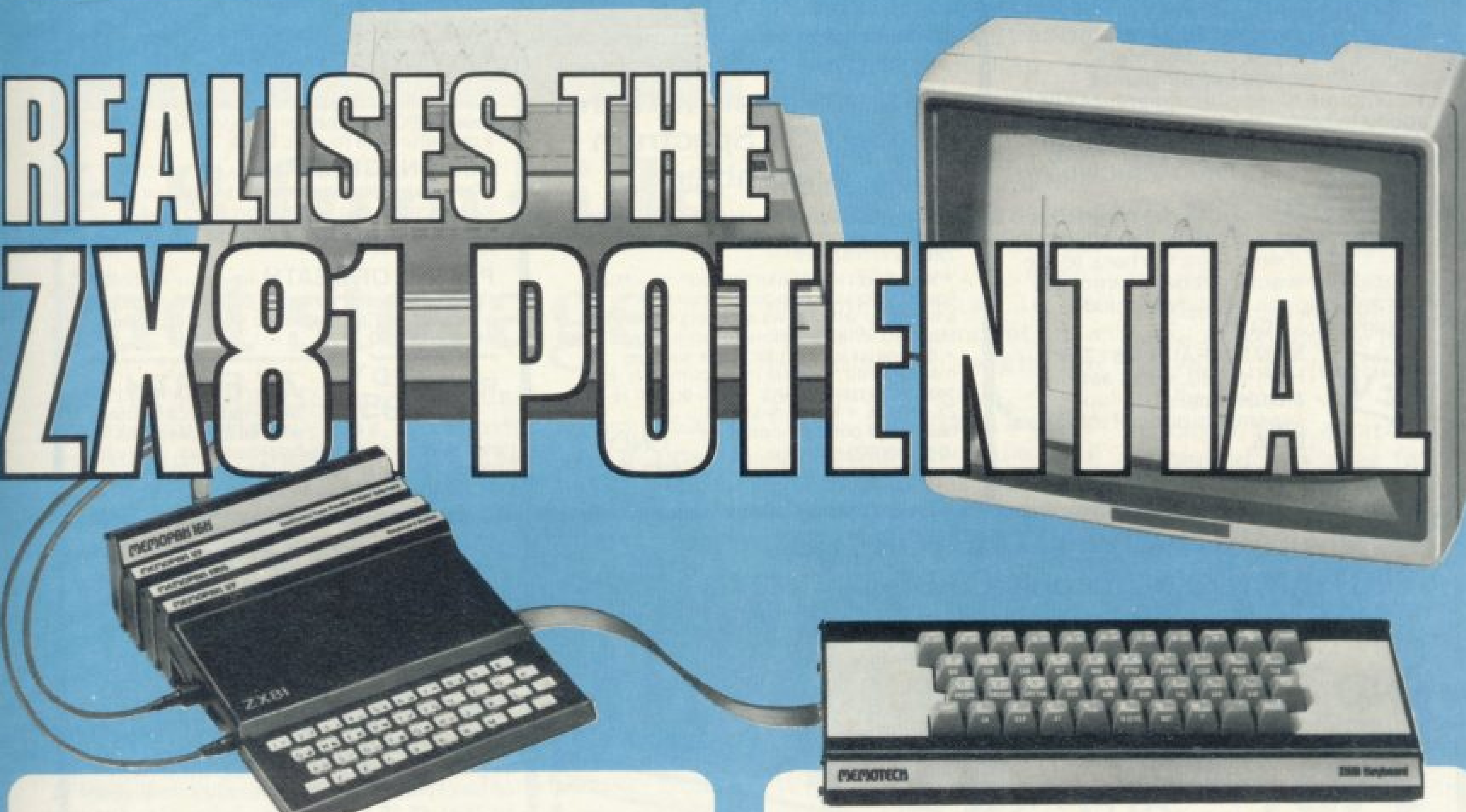


MEMOPAK HRG This pack breaks down the constraints imposed by operating at the ZX81 character level and allows high definition displays to be generated. All 248 × 192 individual pixels can be controlled using simple commands, and the built in software enables the user to work interactively at the dot, line, character, block and page levels. Scrolling, flashing and animation are all here.



MEMOPAK Centronics I/F The BASIC commands LPRINT, LLIST and COPY are used to print on any CENTRONICS type printer. All ASCII characters are generated and translation takes place automatically within the pack. Reverse capitals give lower case. Additional facilities allow high resolution printing. The full capabilities of your printer are now under the control of the ZX81.

REALISES THE ZX81 POTENTIAL



MEMOPAK Z80 Assembler This click-in EPROM based pack accepts standard Z80 assembly language mnemonics to allow you to write faster and more compact programs. It has its own ADD, EDIT, LIST, ASSM and QUIT functions, the editor allowing insertion, deletion, automatic line renumbering and error checking. Source code and object code listings can be displayed and printed in decimal or hex format.

MEMOTECH Keyboard The light-touch positive stop keys of this elegant typewriter-pitch keyboard allow you to work faster, more accurately and more confidently. To speed you along we have added an extra SHIFT key to the array at top right. The keyboard is attached by a cable to the Keyboard Buffer which fits in amongst your other Memopaks or straight onto the back of your ZX81.

To ensure that your expectations are realised, care is taken at every stage to design features into the system to anticipate your frustrations and to forestall them. For example:

A) Memories are cumulative e.g. 16K and 32K can be added to the MEMOPAK 16K or even to the Sinclair 16K RAM pack.

B) The HRG firmware allows commonly used constructions (such as scrolling, shading and labelling graphs), which might otherwise be beyond the user's programming capabilities, to be evoked by a few simple commands.

C) The Centronics I/F converts ZX81 character codes into ASCII and extends the print line to the width of the printer, still using the LLIST, LPRINT and COPY commands.

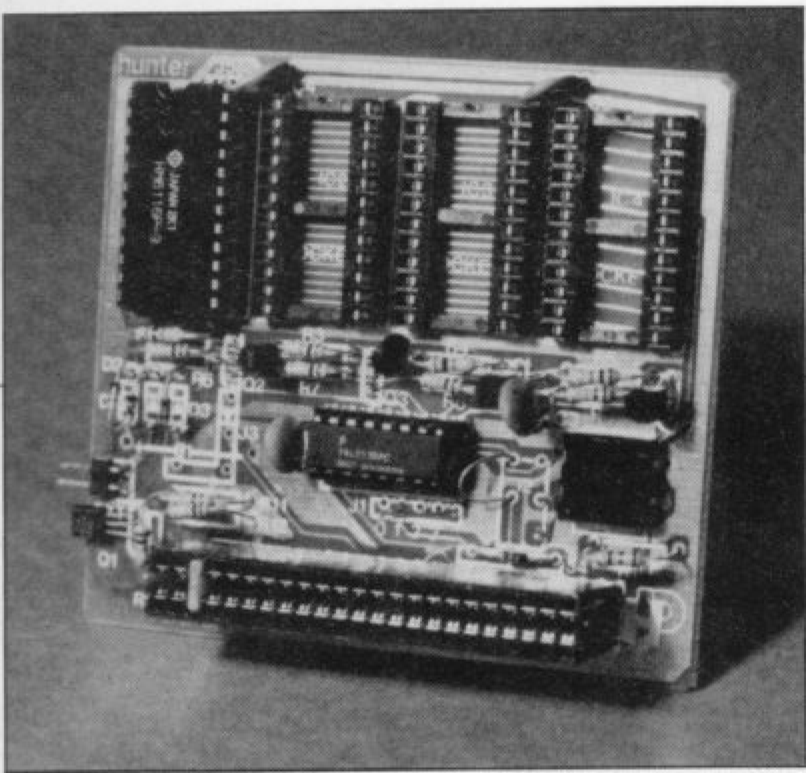
Looking forward, Memotech will continue to back the ZX81 through 1983 with fast storage devices, pressure sensitive electronic drawing boards and more software packs including a wordprocessor and an RS232 interface.

MEMOPAKS may be ordered by post (cheque, Access/Barclaycard quoting number) or by telephone. Please make cheques payable to Memotech Ltd. and please include £2.00 per unit for packaging and postage inland (overseas £3.00).

We want to be sure you are satisfied with your Memopak – so we offer a 14-day money back guarantee on all our products.

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Hunter Products battery — backed RAM board

U.S. firm aids fact storage

HUNTER PRODUCTS, an American firm, has produced a battery-backed RAM board which can be moved about in the memory of a ZX-81 to any 8K section. The board is available as a kit and is very easy to build from the detailed instructions.

The lithium battery included means that the 6116 RAM chips keep the program even when you switch-off the machine, just like a ROM. That means that machine code routines and even Basic can be stored in the on-board RAM, to be recalled at any time without having to load them from tape.

A simple 2K RAM is provided. ROMs and RAM can be mixed on the board but that involves some cutting of tracks. One problem is that the board cannot decode the last address line A15.

One advantage is that you can replace the 8K ROM with a battery-backed copy and then add your own commands or correct the mistakes in the ROM.

The kit costs £19.95 inc. VAT from Hunter Electronics, PO Box 5, Axminster, Devon EX13 5AS. That is a postal address as the company is in the U.S.

The complete expansion unit

DCP INTERSPEC pack is a combination of several other packs produced by the same firm into one box which fits the ZX-81 or the Spectrum. It contains an 8-bit input and output port, four relay-isolated outputs rated at 24V-1amp, four switch inputs — for joysticks, thermostats — and an analogue-to-digital converter with eight channels. That is an appreciable amount in a box only 4½ in. long by 3in. wide and 2in. tall.

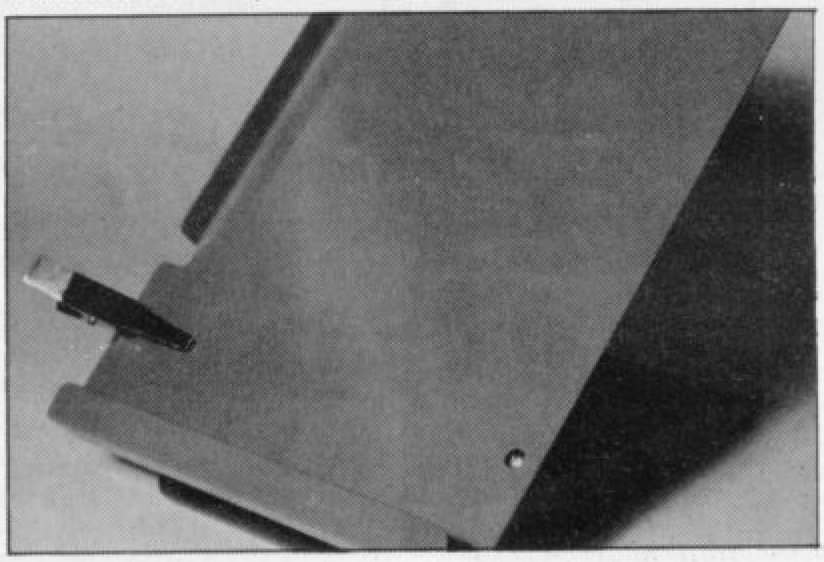
The Interspec has an expansion bus at the back which provides the data, read and write control signals, plus two device-select pins to add to your own interfaces. All are fully-decoded, to the limits allowed on eight address lines, and work very well. DCP Micro Developments Ltd, 2 Station Close, Lingwood, Norwich NR13 4RX. Tel: 0603-712482.

Easier Reader

BRANDON PRODUCTS stocks the easy reader computer stand for holding magazines and books. The metal stand i. very stable and tilts back a magazine at an angle for easy viewing. The magazine is held by a large clip and there are extension arms on both top and right-hand side for large pages. It is very useful for copying-in programs; it folds flat for storage.

Contact Brandon Products, Forest Home, Normansand, Salisbury, Wilts SP5 2BN. Tel: 079439-336. Cost is £14.95 inc. VAT and postage. Brandon also has a range of T shirts and sweat shirts with ZX-81 and Spectrum logos for £3.25 and £6.99 respectively.

Brandon Products' easy reader computer stand



Rosetta award in second year

THE SECOND annual Rosetta Stone Award will be presented sometime in April by Mindware Inc for outstanding intellectual achievement on a ZX machine. The award was presented last year to Dr Ian Logan for his work on the ZX-81 ROM. The award is worth $200 and one year's free subscription to an American computer journal of the winner's choice.

The winner is also presented with a replica of The Rosetta Stone.

Nominations are being taken at present and the judging will be done by a panel of representatives of American and British magazines. Nominations should be sent as soon as possible to Mindware Inc, 15 Tech Circle, Natick, MA 01760, U.S.A.

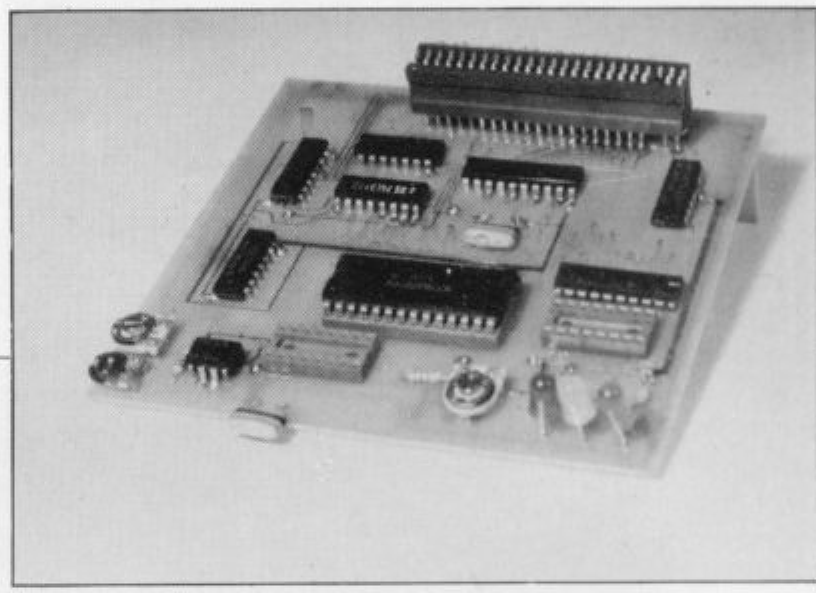
Joystick for all machines

AGF HARDWARE has produced a joystick interface which fits on the expansion port of a ZX-81 or Spectrum and imitates the keyboard. Both versions simulate the cursor keys and the 0 key on Joystick 1 and keys T-Y-U-I-P on Joystick two.

There is no soldering to

continued on page 26





University Computers' analogue port

continued from page 25

do as the board is plugged into the expansion port and any other devices plug in after it. The joystick is very easy to use and it speeds games enormously. The other advantage is that while it is enabled — via a switch — the rest of the keyboard is inoperable, thus preventing errors. Several programs already work with the joysticks though some require the disabling of the joystick while speeds are chosen. The only disadvantage is the cheap edge connector and the fact that you cannot select which keys are simulated — that would allow an arcade game to be played.

Joystick interface costs £15.96, Joystick £7.54 inc. VAT, from AGF Hardware, 26 Van Gogh Place, Bognor Regis, West Sussex PO22 9BY. Interfaces are accompanied by a free cassette of demonstration programs and instructions how to alter your own.

University analogue port

AN ANALOGUE port from University Computers is a memory-mapped device and is designed to be used by the ZX-81 Basic instructions PEEK and POKE. It is decoded into 64 locations just below the start of Basic RAM — 15488-15552.

The first eight locations are used as an eight-channel analogue input port and digital eight-bit output port. That is an unusual combination and, together with the manual, it can provide a complete demonstration unit for schools.

The board is despatched without a box but with an expansion connector at the back for plugging-in the 16K RAM pack. Three LEDs are also provided on the board to test the digital port, as is a light sensor to check the analogue input. There is also an amplifier so that voltages in the millivolt range can be measured.

A full circuit diagram is provided and the manual takes you through a very easy course on how to use the port. The same firm can also supply various sensors for heat, light, sound and gas to fit on to the board. It can also supply various relays up to 25 amp 250V for control applications.

A very good teaching tool at £39.95 inc. VAT and postage from University Computers, 5 St. Barnabus Road, Cambridge.

SPECTRUM – ZX81 – BBC

(1) SPECTRUM ANALOGUE PORT (24 channel control)

8 channels digital voltage input (e.g. for switch closure detection).
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High quality cased unit including all connectors (uses standard 'D' type).

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Optional terminal box and extender cable **£33.00** (ideal for schools, industry) laboratories etc.

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Our popular, industry proven board for measurement and control.
8 channels digital voltage output.
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2 DIL headers for inputs and outputs **£2.00**

(3) TRANSDUCERS FOR (1) AND (2)

Light sensor	£3.00
Reed relay	£2.20

Joysticks, thermometers, humidity sensors, pH probes etc. also available.
Prices and details on application.

(4) EDGE CONNECTORS

Spectrum female	£3.00
ZX81 female	£2.20
male	£1.60

(5) ZX81 EXPERIMENTER KIT

Design notes + connectors (male, female) + veroboard **£6.50**

SOFTWARE — all £15.20 each. Written by Ph.D. Physicists.

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TERMS: Post and packing (U.K.), add £1.00 (30p on item (4)). Europe multiply by two, elsewhere multiply by four. Delivery return of post (otherwise immediate notification, with delivery always within 28 days). Official, bulk, dealer orders welcome.

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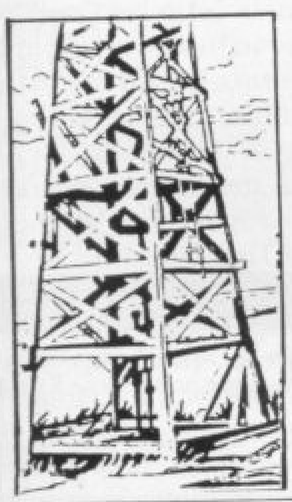
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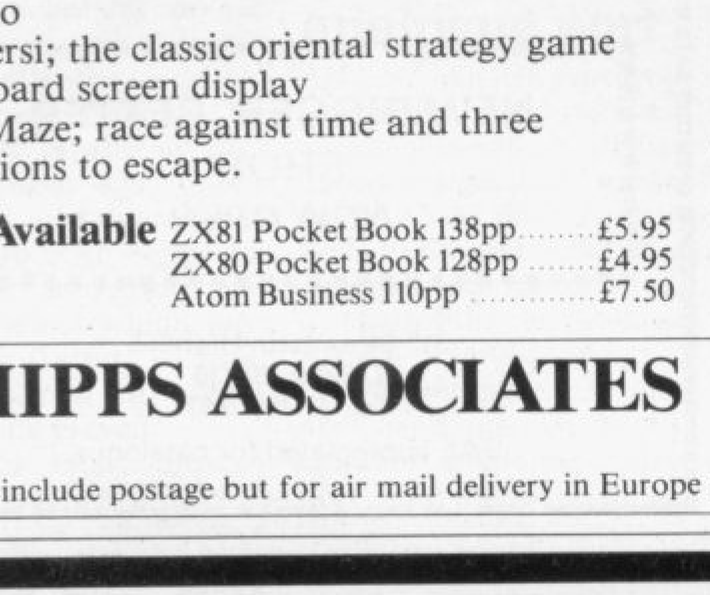
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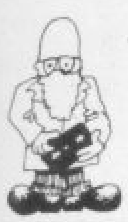
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Microl packages are well worth the wait

CUSTOMERS finally have started to receive their Spectrum software packages from MiCROL and the general impression of the **Use and Learn** and **Spreadsheet** cassettes is very good. Use and Learn consists of a software cassette and well-presented booklet containing explanation and listings of the programs on the cassette.

The first program is an excellent music composer which draws manuscript lines and notes played on the screen as a tune is composed. When the tune has been completed the composer can listen to the music.

The cassette also contains a variety of novel and interesting games, including one in which you have to make a parachutist jump from an aircraft on to a target.

Also included in Use and Learn is a series of useful routines such as Ramtest to check for faults in memory; Tapefile, which lists your collection of tapes; and Memory Map Monitor, which tells you how much memory for programs and variables you have remaining.

The Spreadsheet, for the 48K Spectrum, provides the user with a table, or matrix, which can contain numbers or formulae for solving numeric problems. It can be used in business and the home and closely resembles VisiCalc for the Apple but is less than one-tenth of the price.

Compared to the Vu-Calc spreadsheet produced for the Spectrum by Sinclair it is much clearer and slightly easier to understand. Its one failing compared to the Sinclair version is that it is slower. The decision when choosing to buy either must be a trade-off between facilities and speed.

Both MiCROL software packages are excellent value for money. Both packages cost £9.95 and can be obtained from MiCROL (U.K. Mail Order), Freepost, 38 Burleigh Street, Cambridge CB1 1BR.



Pacman gets look a like

AT LAST someone has produced a **Pacman** game for the 16K Spectrum which looks like the popular arcade game. The Abbex **Spookyman** has four ghosts, dots, power blobs, diamonds, hearts, clubs and the cutest Pacman you will ever see.

The keyboard is divided into three vertical sections with Left control on the left, Right control on the right and Up and Down in the centre. The controls take some getting used to but once they are mastered they make the game move faster.

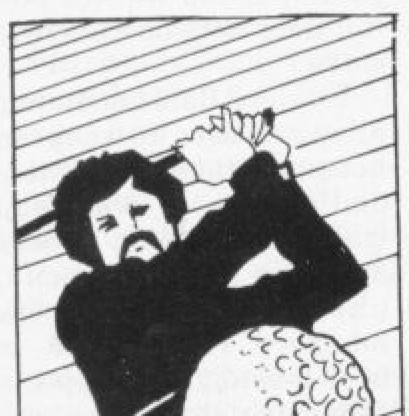
Abbex estimates the total score possible after every screen of the game is 22,400. The player receives a bonus life when 10,000 points have been reached.

Spookyman is available from Abbex, 20 Ashley Close, Manor Hall Drive, London NW4.

Armchair golf

IT IS too cold to go and play a round of real golf, so why not settle in your armchair and play a round on the Spectrum? This version of **Golf** for the 16K Spectrum shows a graphic view of the holes, rough, trees, fairway and lakes. To make a shot the player selects a number, imagining that the ball is the centre of a clock-face.

You then choose the strength of the shot and your ball starts on its way towards the hole — or the lake, depending on how good a player you are.



A variety of penalties are handed-out by the computer when you land in the rough, in a bunker, or out of bounds. For instance, if you go out of bounds the computer will return your ball but you will have a penalty shot against you. If you land in a bunker, the computer will get you out but again you must suffer a penalty shot.

The computer will recognise special scores such as birdies, eagles and a hole in one. The game is interesting for golf fans but is very unremarkable in the software market as several games of golf, one of them very much like this one, have been produced for the Spectrum already.

Spectrum Golf is available for the 16K and 48K versions. It can be obtained from B S McAlley, 78 Hedgerley, Chinnor, Oxon OX9 4TJ and costs £3.95.

Spectacular graphics

THE GRAPHICS capabilities of the Spectrum can produce fairly spectacular results, especially with two cassettes from Video Software, **Superdraw** and **Superview.**

continued on page 30

continued from page 29

Superdraw is for the 16K machine and can be used to create pictures, in high and low resolution. All the graphics symbols on the Spectrum are available through the program and a Prestel-type display can be achieved through a special large alphabet which can be loaded into the program separately.

Superview is for the 48K Spectrum. It acts rather like a personal viewdata system and can hold up to 42 pages of information displayed in two colours and 21 pages in full colour.

The creation of new pages is achieved using a cursor. A large alphabet is also included.

Superview and Superdraw are produced by Video Software Ltd, Stone Lane, Stourbridge, West Midlands DY7 6EQ. Each program costs £5.

Getting as sick as a Spectrum parrot

IF YOU have always wanted to manage a football team, **Football Manager,** from Addictive Games, is for you. The game works on the 48K Spectrum and charts the career of a professional football team from the Fourth to the First Division.

At the beginning you choose your team, which has a full complement of players. The players can be sold and bought during the progress of the game.

After you have selected your team you will be given a position in the league table, usually at the bottom of the Fourth Division. A team will be selected for you to play and highlights from the match will be shown to you in 3D. After that a brief rundown of the rest of the day's matches is given and the league table is calculated for the division.

The skills needed are that you must keep a balance between earning money from the gate returns and winning on the field. It seemed that if you do too much of one the other suffers.

The game is ideal for a football fanatic but the most interesting thing for us was the 3D graphics used to create the goalmouth. The league tables, players' records and match results seemed to bear no reflection of real life. For instance, Kevin Keegan is given a very low skill rating and a transfer fee of £5,000. Apart from that, the game is a winner.

Football Manager costs £7.95 and can be obtained from Addictive Games, PO Box 278, Conniburrow, Milton Keynes MK14 7NE.

If you read the book . . .

MELBOURNE HOUSE, the publisher, has a range of software cassettes to supplement a range of microcomputer books it has just launched. **Spectrum 3** is a tape which contains several of the programs printed in the book *Over the Spectrum*.

The first two programs, *Leapfrog* and **Number Reversal,** are very simple games and use block graphics, no colour and no sound. The idea behind both is to get into correct order a number of randomly-situated objects, such as numbers or frogs, which are in a line. To do so you enter the number of items you want swapped.

The other programs on the tape are much better and make up for the simplicity of the first games.

Over the Spectrum 3 should be used in conjunction with the book of the same name. In that way the user will learn about the programs in the book

Money is the inspiration

SOFTWARE manufacturer J P Gibbons seems to have money on the mind with two new 16K Spectrum cassettes just reaching the market. One, **Casino 1,** is concerned with gambling away money and the other, **Personal Banking System,** is concerned with saving it.



Casino 1 includes three old favourites, **Blackjack, Craps** and **Roulette.** Blackjack and Craps are fairly routine card games where you stake money against the computer pot and, more often than not, lose all of it. The computer seems to hit a winning streak too easily for our liking — perhaps it has a system?

The roulette game is very interesting and we managed to win money from the computer. When the bets have been laid on the roulette board the wheel is spun and a series of numbers flashes on to the screen. If it stops on your spot you win the pot, if it does not you lose your stake.

Personal Banking System allows a user to keep an accurate record of financial affairs. It will keep track of standing orders and even locate a specific cheque through its number. The system is user-friendly and supports separate data files.

Casino 1 costs £4.95; Personal Banking System costs £9.95, including instruction manual. Both cassettes are available from J P Gibbons AIB, 14 Avalon Road, Orpington, Kent BR6 9AX.

The tape costs £4.95 and is available from Melbourne House Group, Glebe Cottage, Station Road, Cheddington, Leighton Buzzard, Bedfordshire LU7 7NA.



A Spectrum collection

IF YOU made a list of the programs for the Spectrum which you never wanted to see again, would it include **Sketchpad, Lunar Lander** and **Mastermind?** In its hurry to produce for the Spectrum, Spectrum Software has put all three programs, with some others, on to one cassette.

Sketchpad can be used to draw pictures using a cursor, the circle command and the Draw command. The pictures can then be saved on to cassette tape.

Lunar Lander and Mastermind are both fairly standard programs. The lander program gives you a spacecraft to land, using the cursor keys, on the surface of the moon. The problem with most of the programs is that you must ensure that the computer is in CAPS mode or the programs will not respond to commands.

On side two of the cassette is a character generator which will allow you to define your own character set. When it has been defined the new character set can be viewed on screen and SAVEd.

The redeeming feature of this package is the diassembler on side two of the cassette. You can list machine code in standard Z-80 mnemonics or assemble your own Z-80 program into machine code. The program is very compact, user-friendly and relatively crashproof.

The package, called Spectrum Software, is available from Spectrum Software, 44-48 Magdalen Street, Norwich, Norfolk NR3 1JE. All five programs can be obtained for £7.95 or you can have any two for £4.95.

Galaxy battle sets a new trend

GALAXY CONFLICT is one of the first games to be produced following a new trend in ZX-81 software, called computer moderated gaming. Two people can play the game. They make their moves with plastic counters on a playing board which has on it a map of a fictional area in space.

The object is to become ruler of the galaxy by building Eoncruisers and maintaining them on planet stations if they are damaged during conflict. A player may take command of any planet station or can take over the bridge of one of the Eoncruisers.

The game played by the computer is a very complex one. Even the amount of wear taken by a mesongun during firing is taken into account.

Players must be very careful to preserve sufficient energy on their planet stations.

Martech, which produces the game says that a leader must have the ability to think clearly, plan ahead and develop a tactical approach to the conflict which will win the prize of galactic control in the end.

Galaxy Conflict, for the 16K ZX-81, is available from Martech Games, 9 Dillingburgh Road, Eastbourne, East Sussex BN20 8LY. It costs £9.95.

New ZX-81 ideas

MICROMEGA, renowned for its business software on the ZX-81, has a cassette of machine code games for the little machine. **Challenge**, for the 1K ZX-81, presents some original and clever ideas. Two of our favourites are **Cartoon Man** and **Juggler**. In the first a little man walks across the screen. You can control his movement using the shift and BREAK keys and increase his speed using number keys.

Juggler is almost the same but he juggles while moving. The idea is to keep the balls in the air.

Road Race is a fast action racing game, a race between two cars on a map, starting in London. The cars are on separate roads but you can go on to your opponent's road during the game. If you cross on to the other car's road in London you cannot pass but if you change in Scotland he cannot pass you.

Challenge contains five machine code games for the 1K ZX-81 and can be obtained from Micromega, Personal Computer Division, Quantec Systems and Software Ltd, 230-236 Lavender Hill, London SW11 1LE. It costs £4.95.



Better part of Sinclair range

THE NEW **Flight Simulation** program from the Sinclair Research Spectrum software library is one of the better offerings in that range. The program runs on a 48K Spectrum and gives you the opportunity, for a short time at least, to become the pilot of a light aircraft.

The program is very interesting and better value than some of the other Sinclair programs.

Flight Simulation costs £7.95 and is available from Sinclair Research, Stanhope Road, Camberley, Surrey GU15 3PS.



Stephen Adams reviews a remarkable little machine from Colne Robotics which could help in writing programs

Inexpensive maths aid goes into production for ZX-81

THE ZEAKER is an electronic device controlled by a ZX-81 through two 2-metre long cables. It consists of a black box with wheels on either side and four sensors mounted on each corner. The motions of each of the wheels can be turned on and off under program control, so that it can be steered by the computer in much the same way as a tank. The motors can also be programmed to go forward and reverse, so that the zeaker can retract from a wall.

The sensors can be used to detect obstructions around the zeaker. The sensors consist of metal plates which are curved around each corner of the zeaker and spring-loaded so that it is held away from the box.

Fixed to the box under the plate are two adjustable metal stubs which form the other half of the switch. When the zeaker hits an obstruction the metal plate touches the metal stub on that side of the corner and completes the circuit. That can be detected by the computer by PEEKing a location in memory. There are four corners, each having two sensors, one on each side of the corner beneath the metal plate, making eight sensors in all.

The zeaker also contains a loudspeaker which is connected to two oscillators inside the interface box. They produce a two-tone horn — which can be switched on and off under program control to indicate obstructions and turning.

There are also three LEDs mounted on top of the zeaker. Two of them can be turned on under program control and the third is used to indicate that the pen, which is underneath the zeaker, is in the down position. The pen is the really important part. It turns it into a turtle-type creature which can be used by teachers to describe mathematics to children in a visual way. The pen is operated by a solenoid mounted in the body of the zeaker which is lowered under the command of the ZX-81. It consists of a cut-down ball-point refill and so is simple enough to replace when it runs out. The pen can be used to follow the motion of the animal and can be raised and lowered at any time.

A program usually associated with drawing by computers through a programmed device like the zeaker is called Logo. Although not available on the ZX-81, a similar set of commands is available via a program on tape with every zeaker. The zeaker can learn a set pattern and with its pen in tow can repeat that pattern at any time.

> 'The zeaker can learn a set pattern and with its pen can repeat that pattern'

If that pattern is the result of a formula or program, the results can be illustrated graphically by running the zeaker over a large sheet of paper and watching the results. If there is a bug in the program the place where it appears will be shown by the trace; thus it is a very simple method of getting children — and I suspect even adults — to program a computer and see if the answer is correct. If the answer is incorrect the trace will give the exact position of the error, so that it can be corrected easily.

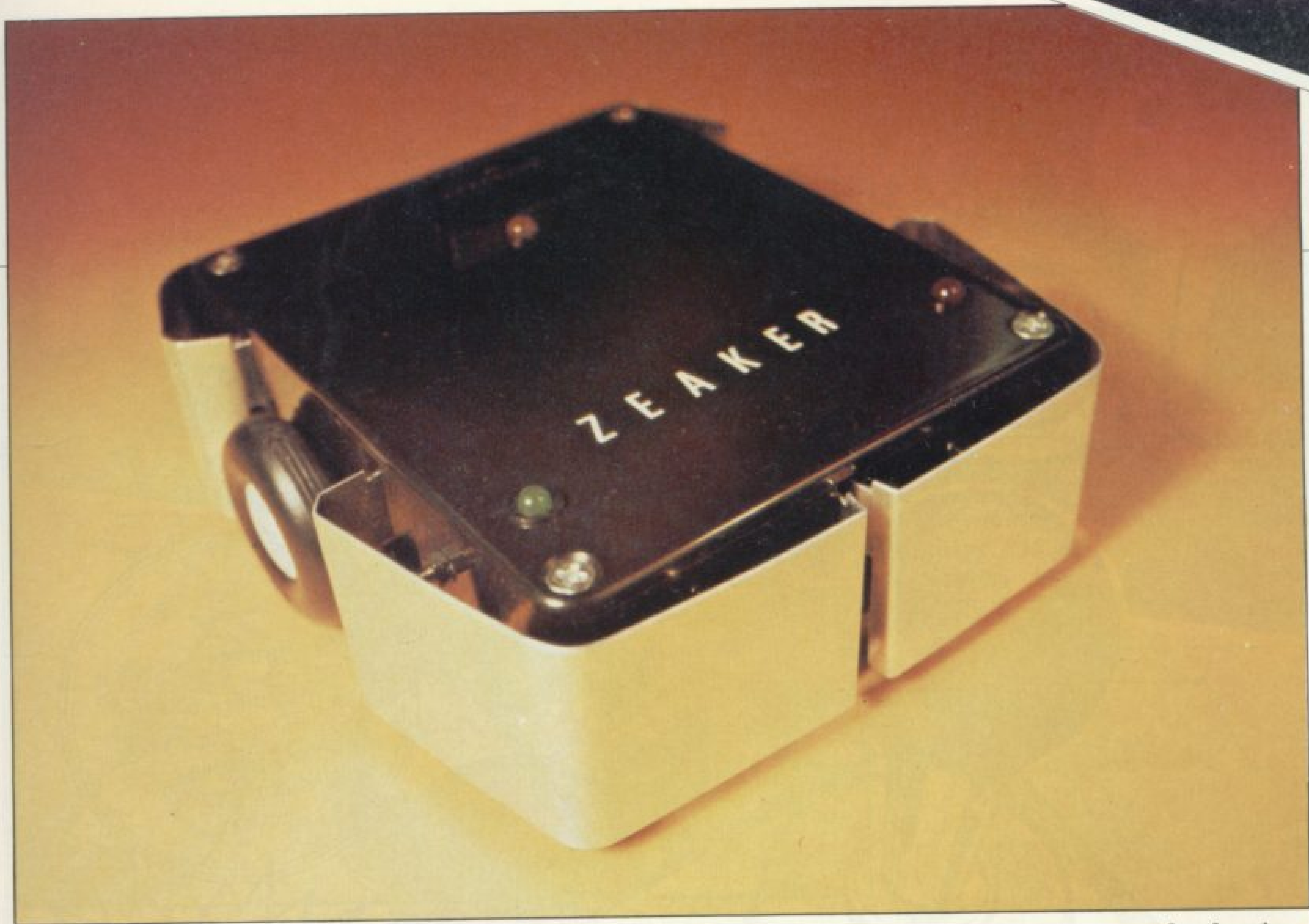
The program in Basic is used to POKE and PEEK at a memory location where a port has been inserted. The demonstration model was running on a Technomatics port but, being Basic, the port used could be any memory-mapped port which provides two eight-bit ports, one input and one output.

The port is not included in the price of the zeaker and Technomatics is understood to have ceased production of the port. That should not affect zeaker users, as Colne has said that it will undertake to supply a similar port at the same price.

The port presents the user with two 16-pin DIL sockets which provide the interface box containing all the electronics and power supply, with eight wires for input, eight wires for output to the zeaker, plus 0V and +5V connections to the computer.

The interface box contains the motor control circuitry for forward and reverse, as well as on and off for both the motors inside the zeaker. It also contains protection circuitry so that it cannot be programmed to go in two directions at once. The interface box is between the port which is attached to the expansion port of the computer and the zeaker and is connected to both via ribbon cables. The ribbon cables are two metres long and so allow the zeaker to roam from the ZX-81. Both ends are terminated in two 16-pin DIL plugs so that they fit into the sockets on the top of the zeaker and the port.

The interface cables to the port



would have to be altered if a different port was used but Colne says it could provide a set of cables for commonly-used ports. The connections, however, will be listed in the manual so that they can be changed over easily.

The zeaker is available as a kit, as well as ready-built, as is the interface box. The two are available together as one package. Construction should not be difficult. The manual includes the circuit diagram, port description — for those who want to use another one — and details of the control codes used. The principles of operation also include tips on how to write your own programs, as well as describing the ones provided.

Two 1K programs provide a demonstration of random action of the zeaker and a 'learning phase', one which allows you to enter a few commands telling where to go. Two 16K programs are also included — they should take up only about 8K, in fact — and once again demonstrate random action, plus a learning function.

The learning function is much more comprehensive than on the 1K machine in that it will allow you to use letters of the commands to program the action of the zeaker. The basic functions will be F(foward), B(backward), L(Left), R(Right), PU(Pen Up) and PD(Pen Down). Those letters are accompanied by a number describing how many steps are to be done under each command.

The commands are combined into a string and then the zeaker is asked to execute the set of commands, which may also be given a name and the ZX-81 told to execute name. That leads to programs made up of a series of command words like box and triangle. To test one of the programs before trying it on the computer, a child can be asked to go through the same series of steps, imitating a zeaker, to check that the program which has been written can be understood.

'The zeaker with interface and port is robust and very simple to use'

Schools and colleges have not generally accepted this method of demonstrating computers because of the previous cost of a few hundred pounds each. Now that the cost of microcomputing power is down to £49.95, Colne has produced this version which will sell at £59.95 as a kit or £69.95 assembled. Remember that does not include the cost of the port required to run it — it cannot be connected directly to the ZX-81 expansion port. The price includes the interface box, the zeaker and power supply. A port can be supplied at approximately £13.

The size of the zeaker is 5½ in. × 5in. × 2in. and it has four ZX-81 programs in Basic. The interfaces and programs could be adapted easily to most computers with a user port.

The Spectrum, Sinclair says, will soon have a version of Logo written for it as part of the package offered under the schools scheme. As there are already ports available for the Spectrum and the Spectrum Basic is ZX-81-based there should be no difficulty using it on either machine — using IN and OUT instead of PEEK and POKE.

The zeaker and interface box, along with the port, was demonstrated by the company for *Sinclair User* and is robust and very simple to use. Colne Robotic Ltd is at 2 Station Road, Twickenham TW1 4LL. Tel: 01-892 7044.

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Play curlygons for a novel design

Variations on a polygon theme by Ian Stewart with the Spectrum in support

AN ARRESTING title, as the policeman said to Lady Chatterley, no doubt referring to a species of Klingon with poodley-wool hair. He's going to tell us how to write Space Inveigler games — better than that — Spectrum graphics.

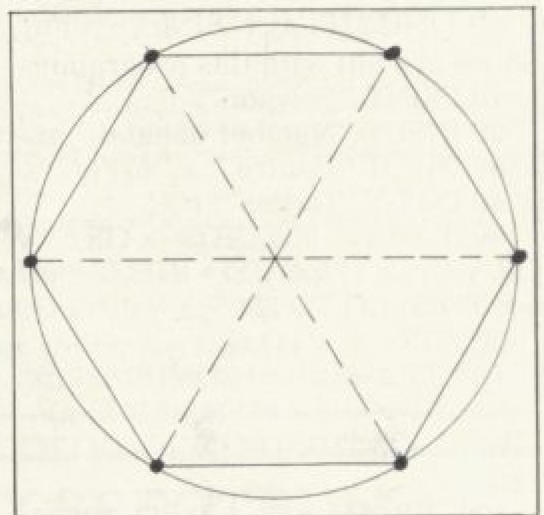
The result will be a very simple 14-line program which produces an enormous variety of attractive graphic displays on the Spectrum hi-res screen. Incorporate it as a subroutine in other equally simple programs and you will be able to cover the screen in intriguing and complex designs, all of them fraught with deep mathematical significance which, fortunately, it is unnecessary to understand to produce the results.

The fundamental principle used is one which pervades the entire computing world. Once you have had one good idea, do not waste effort looking for another one — hack the first one to death instead. Or, to put it more tactfully, apply the technique of variations on a theme.

The theme here is the humble polygon — I won't stoop to mention the schoolboy joke about dead parrots. A polygon is a shape made up of straight lines, which immediately sets one in mind of the Spectrum DRAW command. If we can find where the corners of the polygon should be, the machine can be coaxed into doing everything else.

The most symmetric polygons are the regular ones, which are very democratic — all angles are equal, and all sides are equal. The 50 pence coin is a seven-sided regular polygon with slightly curved sides. A square is a four-sided regular polygon. Honeycombs are formed from regular six-sided polygons — hexagons.

Let us consider a regular hexagon. Here is one:



Notice that I have drawn it inside a circle, to show that its corners are all equal distances from its centre. Notice also that the angles divide the full circle of 360 degrees into six equal portions. So each angle is 60 degrees. If the polygon had n sides, then the angle wold be 360°/n. Mathematicians call this "putting 6=n" or inductive reasoning.

Now all we need is some elementary trigonometry, which I will explain. Get out the stepladder, climb into the attic, and haul down your May issue of *Sinclair User*; look at the article Triggy questions by me. It will tell you that to get things moving in circles you use the functions SIN and COS. If you want a circle of radius r you have to plot points r*COS x, r* SIN x, as x varies

> 'Incorporate it as a subroutine in other equally simple programs and you can cover the screen in complex designs'

continued on page 40



continued from page 39

from 0 degrees to 360 degrees, or rather, there being a mathematician somewhere in the Sinclair camp, from 0 to 2*PI radians. PI = key M in extended mode.

What we have to do is to divide that 2* PI range into n equal bits; obviously we do taking and one nth of it, 2*PI/n, and them (multiples of that, 1*2*PI/n for i = 0,1,2,....,n. So the corners of a regular polygon of radius r and centre 0,0, lie at points whose co-ordinates are:

r*COS(i*2*PI/n), r*SIN(i* + /PI/n).

So we are left with this program:

```
10 PRINT "Polygon"
20 INPUT "Number of sides", n.
30 INPUT "Centre", x;"□";y
40 INPUT "radius", r
50 IF x + r> 255 OR r> x OR r <y OR y + r > 175 THEN INPUT "off edge",d$: GO TO 20.
60 FOR i = o TO n
70 LET u = x + r*COS(i*2*PI/n)
80 LET v = y + r*SIN(i*2*PI/n)
90 IF i = Ø THEN PLOT u,v:GO TO 110
100 DRAW u — PEEK 23677, v-PEEK 23678
110 NEXT i
```

□ = space

Before I explain, type this into your Spectrum and RUN it. INPUT in turn the numbers 7, 127, 87, 75 for n, x, y, r. You will have a big heptagon — seven-sided thingy — in the centre of the screen.

Now the details. First, everything I have said so far assumes that the centre of the polygon is 0,0. Unfortunately that is the bottom left-hand corner of the screen. To adjust to a general centre x,y ($0 \leq x \leq 255$, $0 \leq y \leq 175$) you have to add the x and y lines 70 and 80.

Line 50 is crashproofing; it makes sure your picture does not go off-screen and thus offend the operating system of the Spectrum.

Line 100 could have been made PEEKless but is such a useful trick that it deserves to be mentioned. The system variables in addresses 23677 and 23678 hold the co-ordinates x0 and y0, say, of the last point PLOTted. A DRAW command on the Spectrum draws from that point to a point offset from it by the numbers in the DRAW command. In other words,

DRAW u,v

draws from x0,y0 to x0 + u,y0 + v. That is useful for some applications and a nuisance for others; what you often want is to draw from x0,y0 to u,v. You can write

DRAW u-x0, y-v0

to achieve this but then you need to remember x0 and y0 in the program and watch for rounding errors in arithmetic. Instead, you can "lift" their values from the operating system using PEEK.

That is the theme program; now for variations. One thing which is easy to do is to twist the polygon into a less regular but still very artistic shape. To that you add the line:

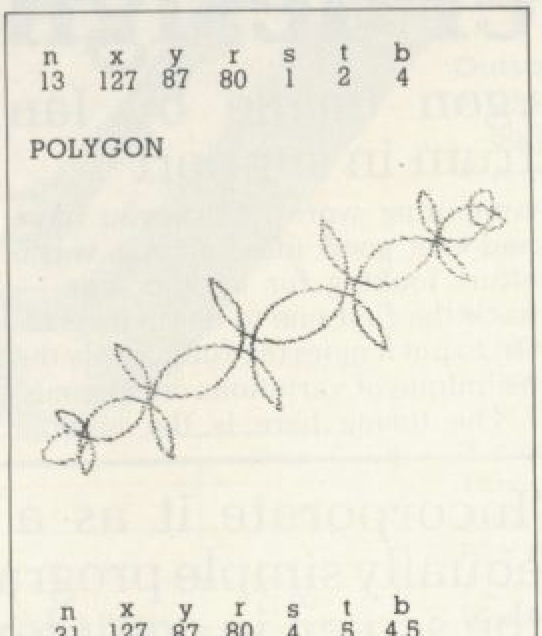
```
45 INPUT "twists",s; "□";t
```

and change 70 and 80 slightly with the EDIT key:

```
70 LET u = x + r*COS(s + i*2*PI/n)
80 LET v = y + r*SIN(t + i*2*PI/n)
```

Another item to exploit is that the Spectrum can draw curved lines. So add:

Figure 1





```
48 INPUT "bend",b
```

and modify line 100:

```
100 DRAW u-PEEK 23677, v-PEEK 23678,-b
```

Then there are more numbers to input. I suggest you go gently at first; for s,t, and b try smallish things like 0.5,1,1.5. They can be negative, too. there are two typical samples of the results in figure one.

n x y r s t b

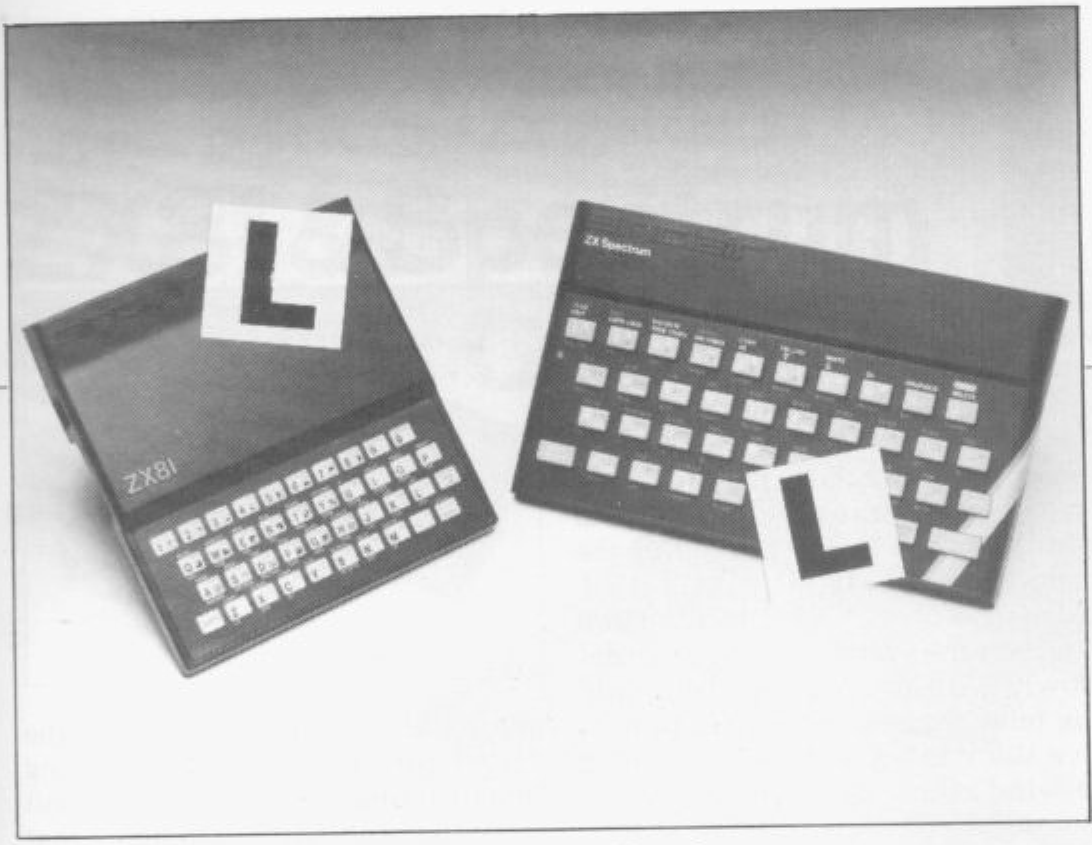
n x y r s t b

That is still not all. If you embed that as a subroutine in a program which goes round a FOR/ NEXT loop, generating values for n,x,y,r,s,t,b and plotting the resulting curlygons on top of each other, you can get very complex results. You can generate the numbers at random or according to a pattern. Here are two samples — add these lines and RUN. The old line 10 is deleted deliberately.

(a)
```
10 FOR 1 = 10
11 LET n = INT(3 + 12*RND)
12 LET x = 127: LET y = 87
13 LET r = INT (1 + 80*RND)
14 LET s = Ø:LET t = Ø: LET b = Ø
15 GO TO 50
120 NEXT q
```

(b)
```
10 FOR q = 1 TO 10
11 LET n = q + 2
12 LET x = 100 + 5*q: LET y = 50 + 5*q
13 LET r = 40
14 LET s = q/10: LET t = q/5
15 LET b = q/3
16 GOTO 50
120 = NEXT q
```

Even then you can add colour commands, or print OVER × , or that is the trouble with an idea, even a simple one; it's amazingly difficult to hack it to death altogether.



Our easy-to-follow guide for new owners of the ZX-81 and the Spectrum

The basic route to a habit-forming hobby

BUYING a Sinclair machine can be the start of a life-time's obsession with home computing. It is easy, however, to become discouraged if everything does not go according to plan from the beginning.

For those with only a little knowledge of computers and their capabilities, the best way to approach the machines is to abandon any ideas for special uses. While the 48K Spectrum is big enough for simple uses in small businesses, the range of Sinclair computers does not contain machines for major uses. It is better to become accustomed to the many facilities and then decide how you wish to use them.

Begin by unpacking your machine, overcoming your surprise at its size and weight and, following the manual, set up the system. If you cannot get the K on the screen, check that everything is plugged into its correct socket and re-set the machine by pulling-out the power plug for one second and try tuning-in again. If still nothing appears, check the power supply unit by shaking it. If it rattles, return it. If it is satisfactory, check your system with that of a friend.

If you have a Spectrum you will have received an introductory booklet which explains what the computer can do and giving detailed instructions on how to set it up. Also included is a fault-finding guide.

Once the K appears you are ready to begin learning about your machine. It can prevent family arguments if you can afford a separate television set for your systems. It also makes life easier if you find somewhere to leave your equipment set up permanently. You will find that a few power sockets are needed and a four-way block connector on a short length of extension cable will help to tidy training leads.

When using a Spectrum, a television set has to be more finely-tuned than when using a ZX-81 because of the added dimension of colour. If the set is not tuned properly, the colours will look hazy instead of sharp and clear. If no colour can be seen when it is switched on, the power supply or the television may be at fault.

Some users have experienced some difficulty with some television sets, which include Hitachi, Grundig and Toshiba. Sets which many people have found compatible include the Sony Trinitron, Fidelity and Ferguson.

The manuals are written in great detail and are reasonably easy to follow. Some of the chapters may not seem immediately relevant but it is worthwhile reading them as you might miss something important.

Patience is needed at that stage to learn the ways in which the computer will accept information. It is tempting to try to enter programs before you are ready but that is likely to lead to errors. For example, words like AND, THEN and AT should not be typed-in letter by letter.

By the time you have reached chapter 11 in the ZX-81 manual and chapter 19 in the Spectrum manual you should have accumulated sufficient knowledge to be able to type-in other people's programs, such as those in *Sinclair User* and *Sinclair Programs*, without too much difficulty.

It is important that when using the ZX-81 it is not jolted. Some of the connections can easily work loose and everything which has been put in will be lost.

The manuals are not to everyone's liking and if you find them difficult to follow a number of books on the market can help you. Find the one which suits you best.

> 'For those with only a little knowledge the best way to approach the machines is to abandon any ideas for special uses'

As a way of relaxing you can buy some of the growing range of commercially-produced software. That can be loaded directly from cassette but make sure that your machine is big enough to take the tapes you buy.

For the ZX-81 there are a few tapes for the unexpanded 1K machine but the majority require the 16K RAM pack. Similarly on the Spectrum most companies are taking advantage of the possibilities

continued on page 44





continued from page 43

provided by the larger 48K machine rather than providing cassettes for the 16K.

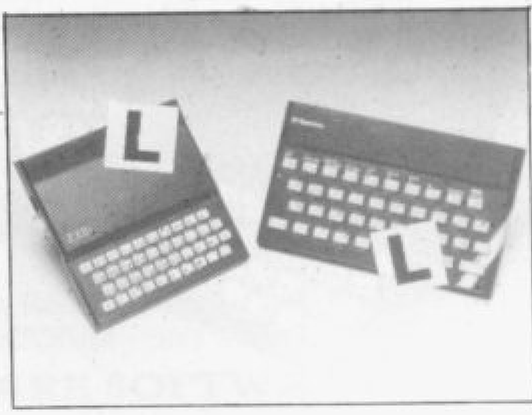
The tapes can vary in quality and it is advisable to read the reviews in *Sinclair User* and use your judgment to find the best.

An alternative method to learn about both the ZX-81 and the Spectrum is to plunge in at the deep end and see what the machines will do. Refer to the manuals when you have difficulties. You can ignore the functions and calculations initially and experiment with PRINT statements to obtain the feel of the machines.

You may already have heard about the problem involved in SAVEing and LOADing your own cassettes. The manual gives detailed instructions but many of the early ZX-81s would not accept tapes from some recorders. That problem is said to have been overcome but there can still be difficulties. Usually they occur when LOADing tapes recorded by other people. One simple method to over-come this is to wind the tape to the middle of the program and type LOAD " " followed by NEWLINE; then increase the volume of the recorder slowly with the tape running until the television screen shows four or five thick black bands. If you then re-wind the tape, the program should LOAD normally.

LOADing and SAVEing on the Spectrum is much easier and faster than the ZX-81. One difference is that when SAVEing on the Spectrum the LOAD lead must be disconnected either at the recorder or the Spectrum.

Finally, a health warning. Apart from any practical uses, computing with your Sinclair machine can be a very entertaining hobby and is almost certainly habit-forming. You may easily find yourself crouched



over your machine, red-eyed, in the early hours of the morning thinking that in another five minutes you will solve the problem. Try to break that habit by getting into the fresh air and meeting other Sinclair users.

By obtaining a Sinclair computer you find that you have joined a not very exclusive club with many thousands of members, many of whom would be only too happy to advise you if you have difficulties.

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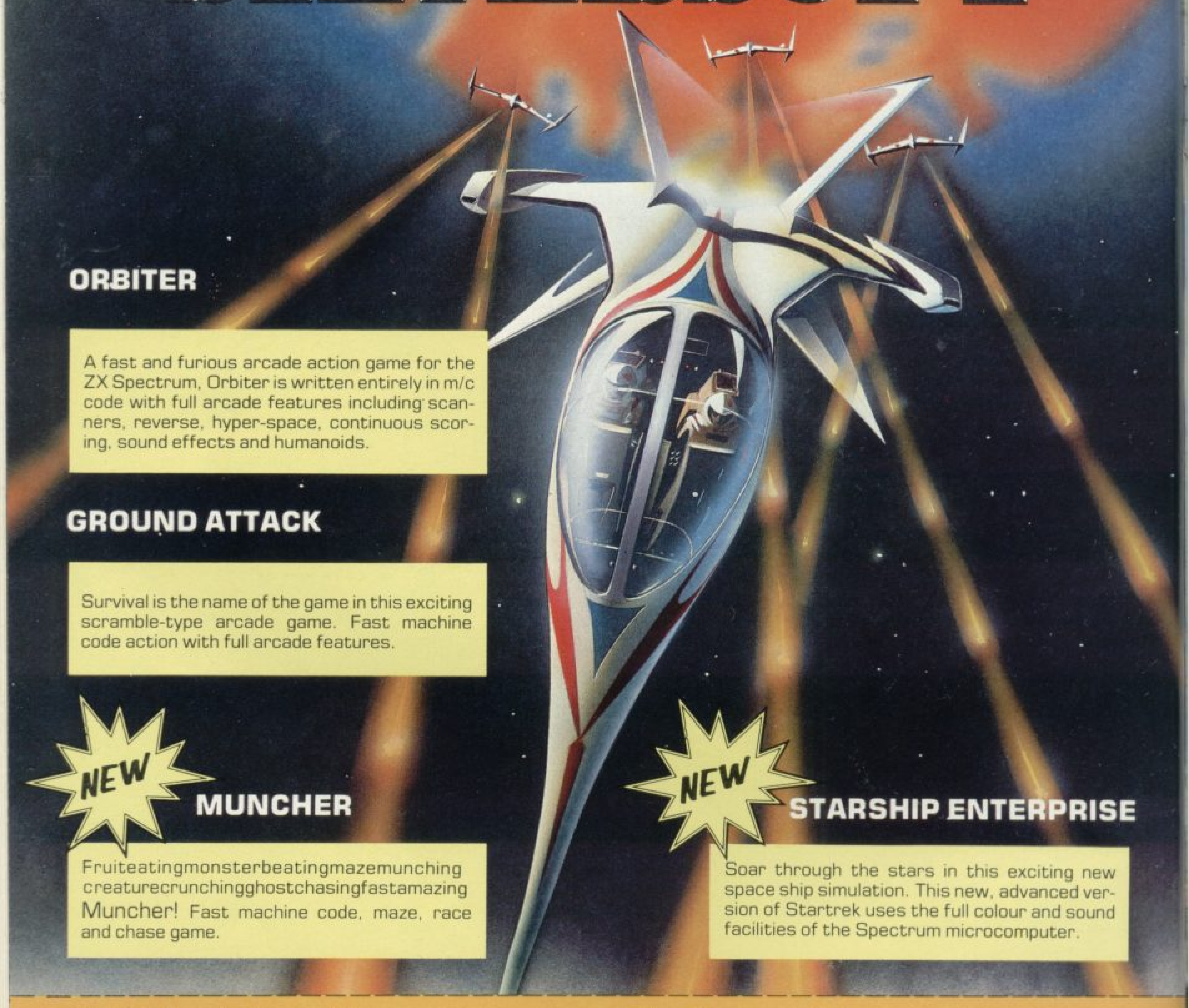
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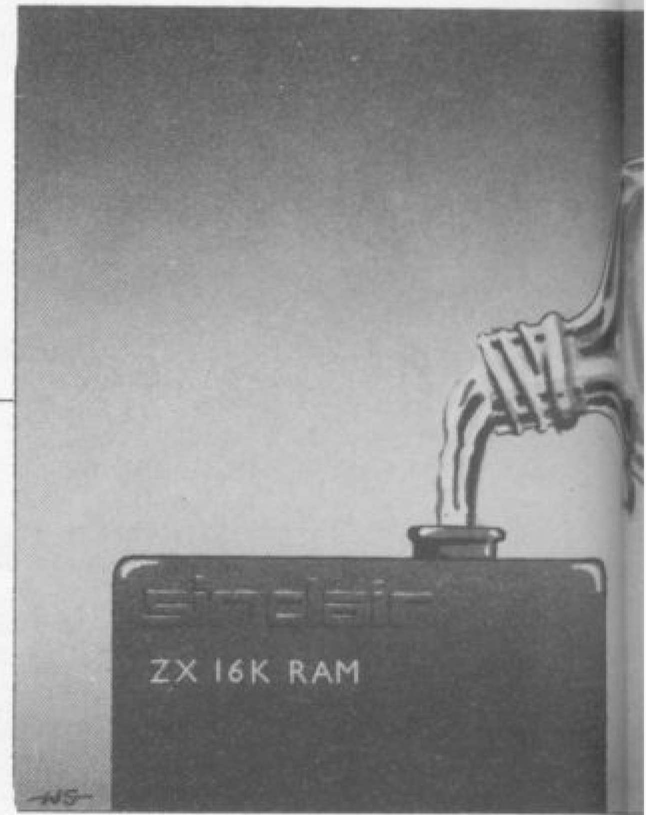
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David Anderson and Ian Morrison give a number of tips on memory saving

Easy ways of getting quart into a pint pot

AS MANY of the thousands of ZX-81 owners will know, the 1K memory provided in the basic machine is often insufficient for even the simplest of programs. That can leave the user frustrated as he thinks of the program he could have written had he bought a 16K RAM pack. Therefore any bytes of memory which can be saved in a program are of great importance.

There are many ways in which vital bytes can be saved on a 1K machine. Once mastered, the user will discover that his computer is very versatile.

The ZX-81 1K — 1,024 bytes — of memory is filled with 124 bytes used by the machine as its system variables; x bytes for the program; y bytes for the display file — varies depending on how much is printed — and finally z bytes for the variables defined during the program.

Each line in a ZX-81 program takes five bytes as soon as it is entered — two bytes for the line number, two more for the length of line, and one byte at the end for the NEWLINE. Anything typed in the line will take up more bytes. Thus REM statements should be removed as a needless waste of memory, as they serve no useful purpose except in a machine code program.

More memory can be saved by making one line out of two. Thus:

```
10 LET G = 15
20 IF INKEY$ = "5". THEN LET
  G = G–1
30 IF INKEY$ = "8" THEN LET
  G = G + 1
40 GOTO 20
```

can be replaced by

```
10 LET G = 15
20 LET G = G + (INKEY$ = "8") -
  (INKEY$ = "5")
30 GOTO 20
```

The removing of one line saves the five bytes which are taken up by each line and because of that saving the program will RUN considerably faster.

The method shown, making two INKEY$ lines into one, is a type of conditional statement similar to IF. The condition inside the brackets can either be correct or incorrect. If it is correct the result of the brackets will be 1 but if it is incorrect the result of the brackets will be 0. Therefore if the user were pressing "8", the result of the first bracket would be 1 and the second would be 0. Under those circumstances G would increase by one. An expansion of the system is shown in the following two programs:

Original

```
10 LET G = 15
20 IF INKEY$ = "5" THEN LET
  G = G–1
30 IF INKEY$ = "8" THEN LET
  G = G + 1
40 IF G< 0 THEN LET G = 0
50 IF G> 30 THEN LET G = 30
60 GOTO 20
```

After revision

```
10 LET G = 15
20 LET G = G–(INKEY$ = "5' AND
  G> 0) + (INKEY$ = "8" and G< 30)
30 GOTO 20
```

Probably the most effective and possibly the simplest method of saving memory is by the use of constants which are non-varying variables. First, you define a variable e.g., 10 LET N = a number used more than twice in the program, at the start of the program and wherever that number appears in the program substitute it with the variable.

> 'Constants will save memory only if the number is used three or more times'

As proof of its effectiveness, 0.9K was saved in a 16K program by the use of only one constant — zero.

In a program line a number is stored as follows:

Number as it appears in the program	Byte containing 126-(7Ehex)	Exponent Byte	Four mantissa bytes
storage of the number ten			
1,0	126	132	32,0,0,0

When using a variable the number will take up only one byte of memory. Constants will save memory only if the number is used three times or more in the program.

If, however, there is a number in a program which is used only once or twice there are two more relatively-efficient methods of saving memory in this.

If the number is between 0 and 255, the function CODE can be used:

```
10 LET T = 14
```

can be replaced by:

```
10 LET T = CODE ":"
```

That will save four bytes of memory. This method will be effective for those numbers which have a character assigned to them but will not work for those numbers 67 to 127, as they are not used in the ZX-81 character set.

The second method is for those numbers above 255 or between 67 and 127. It makes use of the function VAL, thus: 10 LET V = 300 would become

```
10 LET V = VAL "300"
```

The use of VAL will save three bytes of memory.



Numbers above 999 which can be written easily in scientific notation should be written in scientific notation in conjunction with VAL, which will save even more memory — 10,000 can become VAL "10000" which can become shortened even further to VAL "1E4" which saves another two bytes.

After all those methods have been employed there are still a few more ways of finding those extra bytes. A 0 can be replaced by NOT PI. That takes up two bytes and saves five bytes over the seven-byte number zero. A "1" can be replaced by SGN PI. That uses only two bytes and saves five bytes over the seven-byte number one. A "3" can be replaced by using INT PI, which also saves five bytes.

Galaxians is a simple 1K invaders program which makes use of the whole screen area. There are four types of invaders — on-screen display of base, missile and alien plus score, highest score and highest scorer's name. All those superb features are achieved by some powerful memory-saving programming.

The features to note in the LISTING are the absence of REM statements, as few numbers used as possible and the use of four constants. Conditional brackets are also put to their fullest use.

Four constants are used R,N,U, and W which are set in lines 2 to 5. They are followed by the variables H$,H,S,P,X,Y and A$ in lines 6 to 90.

The FOR — NEXT loop T is used to move the invader down the screen. That is the most effective way of doing it.

Line 110 is the INKEY$ line which controls the movement of the missile base. That makes the fullest use of conditional brackets. Note that the AND inside the brackets stops the base from moving off either side of the screen.

In line 120 everything to be displayed is printed, for three reasons — memory is saved as all the printing is done in the one line, everything is displayed speedily and that leads to little flicker after the CLS in line 119.

Line 130 tests to find whether an alien has been hit. Line 140 resets the missile when necessary. Line 150 moves the missile upwards. Line 160 moves the alien horizontally to either side at random.

Lines 200 to 250 are used at the end of the game. Note that the CLS in line 240 empties the display, thus leaving sufficient memory for the initilisation routine in lines 20 through to 90, i.e., memory is saved here by adding an extra line to the program.

To play Galaxians first RUN the program. Alien after alien will dive towards you. Use keys "5" and "8" to manoeuvre your base. Key "0" to fire. You cannot move and fire at the same time due to the basic INKEY$. As your score increases the type of invader will change. The random invader scores a bonus of 200 points.

At the end of the game if the score does not appear but instead an INPUT prompt appears that means you have set a new highest score and the computer is waiting for you to INPUT your initials of up to five characters. Once the score has appeared, press NEWLINE for another game; any other INPUT will end the game. In that eventuality GOTO 20 will start the game once more with the highest score retained.

```
   2 LET R=CODE "+"
   3 LET N=NOT PI
   4 LET U=VAL "2"
   5 LET W=SGN PI
   6 DIM H$(VAL "5")
  10 LET H=N
  20 LET S=N
  30 LET P=CODE "?"
  40 LET Y=R
  50 LET X=RND*R
  60 LET A$="graphic T,6,Y"
  70 IF S>VAL "1E3" THEN LET A$=
"C graphicY,7,T"
  80 IF S>VAL "2E3" THEN LET A$=
"W graphicT,6,Y"
  90 IF RND>VAL ".9" THEN LET A$
="COS graphic 5-graphic8"
 100 FOR T=U TO R-W
 110 LET P=P+(INKEY$="8" AND P<2
8)-(INKEY$="5" AND P>N)
 119 CLS
 120 PRINT AT T,X;A$(U TO );AT Y
 130 IF Y>T OR ABS (P-X)>=U THEN
GOTO VAL "140"
 131 PRINT AT T,X;"-=-";AT T,X;C
ODE A$;CHR$ N
 132 LET S=S+CODE A$
 133 GOTO CODE "C"
 140 IF Y<=T THEN LET Y=R
 150 LET Y=Y-U*(INKEY$=STR$ N OR
Y<R)
 160 LET X=INT (X+RND*3-W-(X>28)
+(X<W))
 170 NEXT T
 200 IF H<S THEN INPUT H$
 210 IF H<S THEN LET H=S
 220 PRINT AT R,P;"X*X";AT N,N;"
SCORE ";S;" HI ";H;" BY ";H$
 230 INPUT A$
 240 CLS
 250 IF A$="" THEN GOTO CODE "="
```

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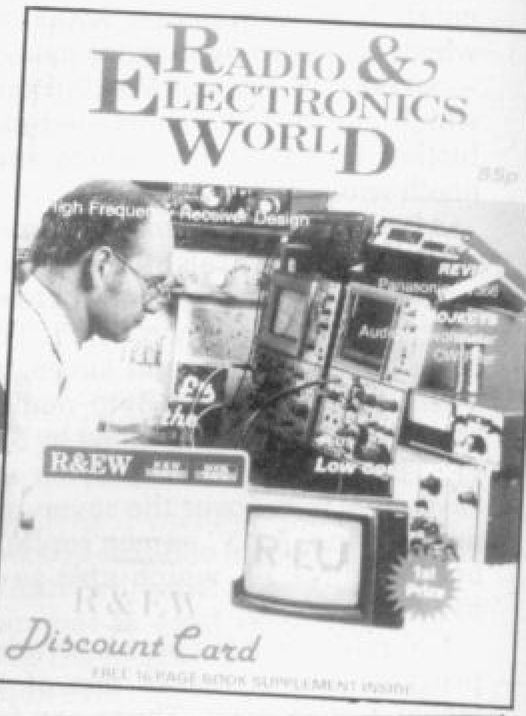
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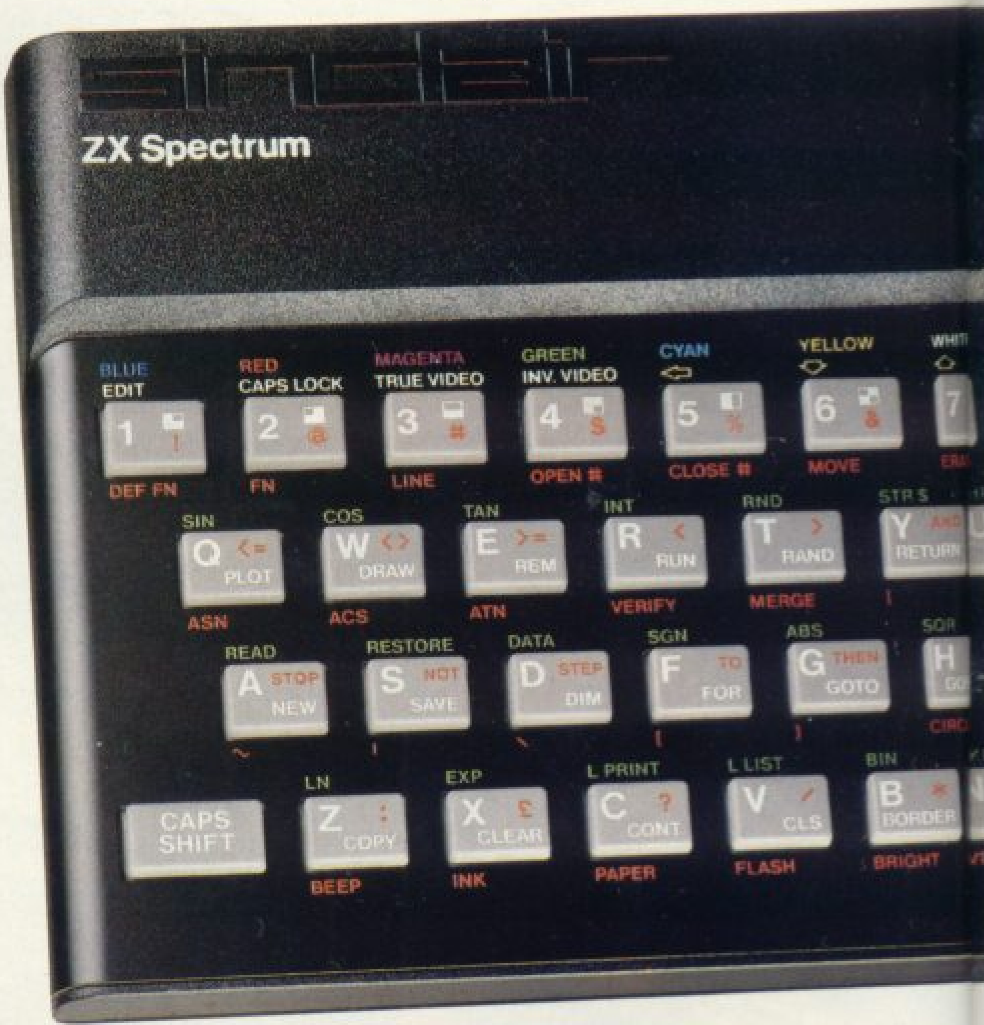


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John Gilbert continues his course

Breaking into the program process

LAST MONTH I explained how to draw a flowchart of a program by splitting it into parts. Each part corresponds to an operation performed either by the user or the computer program. This month we take that a step further and examine a way of breaking a program code into easily-understood areas.

There are three main operations performed in a program — input, processing by the computer, and output. Each of those operations has a distinct box in a flowchart and each has a distinct part in a program. If a beginner is to use the program the input section will be the longest, because of error-trapping techniques and instructions. The processing part of the program will be the longest if a technical person, such as a scientist who knows about computers, uses it.

Now to deal with methods of prompting a user to enter information into the computer and the best ways in which the computer can handle that information. With programs such as the database, which is to be constructed in this series, the screen display is very important. The computer uses the screen to display information to a user.

Many people who use programs such as databases or word processors will know nothing about how a computer works or what it expects as input. The more information given to the user by a program the better. That does not mean clogging the screen with vast quantities of text. Instructions on the screen should be easy to read and well-spaced. The clear screen command should be used as often as possible to break-down information into easily-read pieces but at the same time the jump between one screen of instructions and another should be almost transparent to the user.

The text must flow naturally and there should be no illogical jumps in the instructions. That is a matter of experience but the database has been designed with clarity of instructions and prompts for inputs in mind.

The most important instructions should stand out from the rest. That can be done by liberal use of the commands BRIGHT, INVERSE and FLASH on the Spectrum and the GRAPHICS mode on the ZX-81.

Listing one is the menu subroutine for the database. It is written for the Spectrum but is easy to re-write for the ZX-81. To do that take out the INVERSE in 1020 and 1021, BRIGHT in 1021 and FLASH in 1040. INVERSE can be substituted with the GRAPHICS inverse lettering of the ZX-81 and the title MENU should have spaces between each letter to make it more prominent.

The menu should not be surrounded by a border of a different colour, as that can confuse a user and make the screen look crowded. It is also important not to use excess graphics commands. A display with FLASH or INVERSE all over the screen is just as confusing as if they were not there.

One other thing which people tend to forget is that they have the use of all the screen. Do not cram things into the corners or sides of a screen. Titles should be central and if there is only an INPUT prompt on the screen, a good place to put it is the top left-hand corner.

Listing one is the first module of the program. If there is a menu in a

continued on page 58

Listing 1

```
  100 DIM b$(100,20)
  200 GO SUB 1000
  300 IF a$="1" THEN GO SUB 2000
  400 IF a$="2" THEN GO SUB 3000
  500 IF a$="3" THEN GO SUB 4000
  600 IF a$="4" THEN GO SUB 5000
  700 IF a$="5" THEN GO SUB 6000
  800 INK 6: CLS : BORDER 2: PRIN
T FLASH 1;AT 10,8;"ENTER A NUMBE
R 1-5": PAUSE 200
  900 GO TO 200
 1000 PAPER 0: BORDER 0: INK 4: C
LS
 1010 PAPER 0: BORDER 0: INK 4: C
LS
 1020 INVERSE 1
 1021 PRINT INVERSE 0; BRIGHT 1;
INK 6;TAB 14;"MENU"
 1030 PRINT AT 5,7;"1  SEARCH FIL
E   ";AT 7,7;"2  DISPLAY FILE  "
;AT 9,7;"3  LOAD FILE     ";AT 1
1,7;"4  SAVE FILE     ";AT 13,7;
"5  CREATE FILE   "
 1040 INPUT '''' INK 6; FLASH 1;"
ENTER OPTION (1-5)";a$
 1050 IF a$="" THEN GO TO 1040
 1060 RETURN
```



continued from page 57

program it should be situated at the top of the code after any single or array variables have been declared, as in line 100 of listing one.

The menu module will display the options available from the program, ask which you require, put the number of the option selected in a string variable A$, and transfer to the control program, also in listing one, at the top of the code. The control program, consisting of a series of IF . . . THEN instructions, will then transfer to the subroutine selected from the menu.

The two other modules which are listed in this article are for LOADing data files — listing two — and SAVEing files — listing three. They are for the Spectrum but ZX-81 users can add toolkit routines available from such companies as JRS Software. They will handle data files for the ZX-81. If you do not want to go to that expense you will have to SAVE the program and variables together.

Listing 2

```
4000>REM LOAD ROUTINE
4010 CLS : INPUT "NAME FILE TO B
E ENTERED ";c$
4020 IF LEN c$>6 THEN LET c$=c$(
1 TO 6)
4030 IF c$="" THEN GO TO 4010
4040 PAUSE 10: CLS : PRINT ''''
'' FLASH 1;"SET UP TAPE AND PRES
S NEW LINE": PAUSE 0
4050 PRINT '' INVERSE 1;"FILE '"
;C$;"' LOADING"
4060: LOAD c$ DATA b$()
4070 PRINT ''''''TAB 10;"FILE L
OADED              ": PAUSE 100
4080 RETURN
```

ZX-81 owners will have to break out of the program by erasing the left-hand quote mark of an input and typing STOP. Then type SAVE "program name". When LOADing it back in, do the usual load but do not press RUN. Instead use GOTO 200.

The SAVEd program can be verified on the ZX-81 by re-winding the tape, typing LOAD " ", and re-entering the program you have just SAVEd. If the program has SAVEd correctly an 0/0 error code will appear; if not you will get another number error code. If that happens you will have to re-SAVE.

In the SAVE and LOAD routines a file name is asked for in lines 4010 and 5010. On the Spectrum a file or program name can be only 11 characters long. To stop the program crashing if the name typed-in by the user is too long, lines 4020 and 5020 will take only the first six characters of a file name. The other letters are cut off or truncated. Truncation is also used to cut the YES/NO inputs to Y or N.

The displays in both the SAVE and LOAD routines are important. Error messages should be displayed in the same position on the screen every time they appear. Every program should have a standard error message area to which the user will become accustomed. In the case of the database, that is in the middle of the screen. Also the error message in line 800 is BORDERed in red to warn the user that a specific input is required.

Be careful about using the word "input" in a prompt, as it is computer jargon. The word "enter" is preferred as is shown in line 1040 of the database.

Listing 3

```
5000 REM SAVE ROUTINE
5010 CLS : INPUT "ENTER FILE NAM
E ";c$
5011 IF c$="" THEN GO TO 5010
5020 IF LEN c$>6 THEN LET c$=c$(
1 TO 6)
5030 PAUSE 10: CLS : PRINT ''''
'' FLASH 1;"SET UP TAPE AND PRES
S NEW LINE": PAUSE 0
5040 PRINT '' INVERSE 1;"FILE '"
;C$;"' BEING SAVED         "
5050 SAVE c$ DATA b$()
5060 PRINT ''''''"FILE '";c$;"'
SAVED."''"REWIND TAPE TO VERIFY"
''"AND PRESS NEW LINE.": PAUSE 0
5070 VERIFY c$ DATA b$(): CLS :
PRINT '''''''"FILE '";C$;"' VERI
FIED"
5080 RETURN
```



The prompts and information in the SAVE and LOAD routines may seem simple and not worthwhile but the writer knows about the internal workings of the program and what to enter. A newcomer to a program, on the other hand, needs to be taken through it step by step.

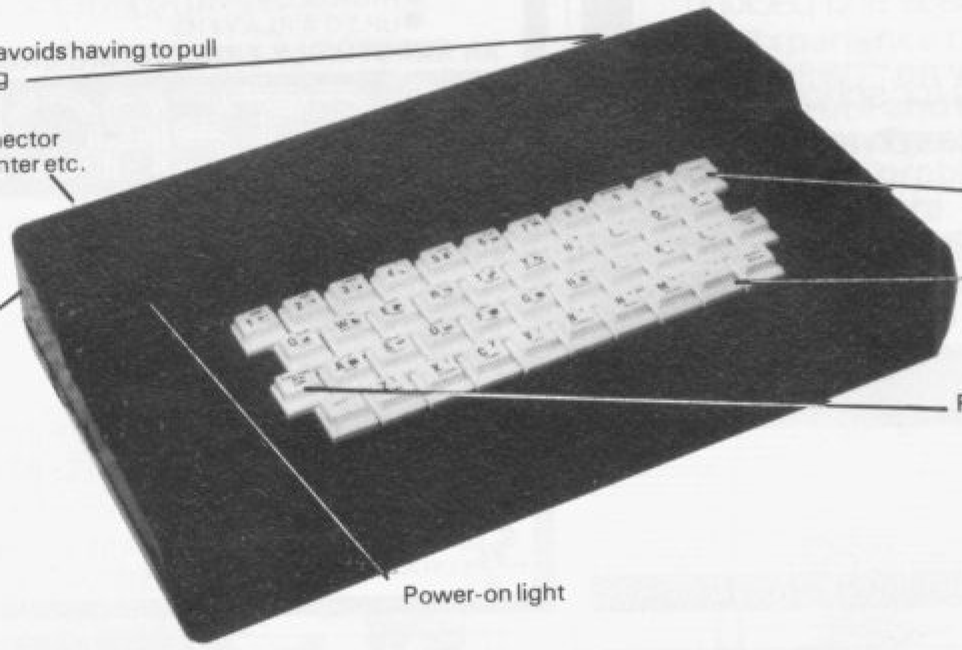
When a module of a program has been written it is a good idea to test it on a friend or relative who knows nothing about computers. If they can follow the prompts, leave the display as it is; if they are confused, you know you have more writing to do.

I have now shown how the database is controlled using the menu and how to ease a user's task in getting through the program. Data storage and retrieval for the system has also been covered. Next month I will explain how data structures are created, how files are sorted, and how a piece of information which you want to retrieve is located for output in a matter of seconds using a special computer search routine.

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With the Spectrum, program writers have been able to write more complex games. John Gilbert investigates this new move

Sinclair brings the thrill of the arcade into your home

ALMOST every major type of arcade game has been simulated on Sinclair computers. There are also new games which have an arcade format but have evolved on a microcomputer. The Spectrum is an ideal machine on which to play arcade games. The quality of them has improved substantially since the launch of the machine. Some of the first arcade games to be produced for the Spectrum were versions of Space Invaders, the game which started the arcade craze.

Spectral Invaders was the first to be announced by Bug Byte, which was already renowned for its arcade and adventure games on the ZX-81. So far it is the game which most closely resembles the original arcade version. Although it is slow it is difficult to score points, as you can fire only one laser blast at a time.

By the time the laser bolt has reached the place where you wanted it to go, the target invader has moved on. That means that a great deal of anticipation and skill is required. Graphically, the Bug Byte invaders is the best, with rows of different-colour aliens crossing the screen and large motherships moving from one side of the screen to the other at random intervals. Spectral Invaders is well-presented and costs £5.95.

Another invaders game, **Space Intruders,** was launched at about the same time as Spectral Invaders. The game is much faster and is recommended for those who like to keep their fingers on the fire button and amass a big score. The only criticism is that the aliens and mothercraft are very small and the mothership is blue on a black background and so is very difficult to hit. Apart from that Space Intruders from Quicksilva is good value at £5.95.

Namtir Raiders, for the ZX-81, is a space invaders game from Artic Computing with a difference. The player still has to face the hordes of aliens which come down the screen but the laser base can be moved up and down as well as left and right.

The greater movement permitted to the player is compensated by the hail of bombs dropped by the aliens and the size and power of alien ships. There are four waves of aliens and as the game progresses the ships get bigger until the giant mothership arrives.

The player has five laser bases during the game and they can take only five hits from alien bombs. There are three levels of difficulty — easy to impossible. The game, costing £3.95, is addictive and the graphics are neither awkward in design nor jerky in movement.

The game which is gaining popularity with 48K Spectrum owners is **Timegate,** from Quicksilva. The authors claim that it is the ultimate in 3D arcade space action. The game is loaded in two parts, the first being a lengthy instruction manual. After the manual has finished you can load the game. The object is to destroy a race of aliens called the Squarm who are trying to colonise Earth. To do that the player must fight the enemy in space and go through time by locating a series of Time Gates to find the Squarm's base.

The pleasant thing about the game





is its graphics. The player is at the controls of a space fighter and looks out into a 3D representation of space. The enemy fighters are also seen in 3D and so are the planets on which the player can land to refuel and repair the ship. It is by far the best arcade action game so far for the Spectrum and costs only £6.95.

Asteroids is also becoming popular on Sinclair machines. One of the first companies to launch a version for the ZX-81 was Quicksilva. It was a good version on such a small machine and is still proving popular.

Quicksilva has also introduced a Spectrum version called **Meteor Storm.** It has the added attraction of speech before play. It is difficult to hear the words but we are informed by the authors that it says "Meteor Alert . . . Meteor Alert . . .". Meteor Storm is a novel version of Asteroids and costs £5.95.

Sinclair Research has a good game of asteroids, called **Planetoids,** in its new Spectrum Software library. The asteroids are in 3D and much careful design work on both the asteroids and the player's ship seems to have gone into the game. Planetoids costs £5.95.

Artic Computing seems to be the only company to have produced a version of Galaxians for the ZX-81. **ZX-Galaxians** looks a little like Space Invaders but the invaders are 'V'-shaped and are supposed to be inter-galactic birds. The birds swoop from formation and bomb the player's laser base. ZX-Galaxian is slow in action but can still be a very addictive game. It costs £4.95.

Defender is still a much-sought-after game in the arcades and Artic Computing took advantage of that early in 1982 by producing a version for the ZX-81. The graphics are not particularly interesting and the spaceship which the player flies across the landscape is made up of a series of blocks which look only slightly like a ship.

Despite those criticisms, the original idea behind the game is still there and the Artic version can be exciting, as you see the enemy ships rushing at you from the other side of the screen.

Now that the Spectrum has arrived, many manufacture have found an interest in the arcade game **Scramble.** The best and fastest version so far is from Mikro-Gen. In the game you have to go through caves which become smaller and smaller as it progresses. There are four sectors to the game, including Missiles, UFOs and Meteors. The player has to destroy the missiles which are fired from the ground at the player's ship, destroy UFOs with a laser blaster, and dodge the meteors.

The game becomes progressively more difficult and can be run in slow, normal and fast modes. It costs £3.95.

Silversoft has produced a Scramble-type game called **Ground Attack.** It works on the same principles as the Mikro-Gen game but is much slower. There is a good deal of blank screen between game rounds and the average waiting time between rounds is 15 seconds. Ground Attack costs £5.95.

The range of arcade-type games on Sinclair machines is always increasing. Manufacturers seem to feel safe in producing standard arcade games such as Space Invaders and Scramble. Those games, especially for the Spectrum, are becoming more imaginative and the graphics and sound more impressive.

Manufacturers have to be careful about copying ideas from other games but with the imagination of some of the firms in the Sinclair market, children and many adults will be kept happy with arcade-type games on the ZX-81 and Spectrum for a long time.

Space Invaders games have now been overtaken by **Pacman** in popularity. A number of them have been produced for the ZX-81 and several companies are producing them for the Spectrum. It looks as if Pacman may provide the next boom in Sinclair software — but that is another story.

> 'With the imagination of some of the firms in the market, users will be kept happy with arcade games for a long time'

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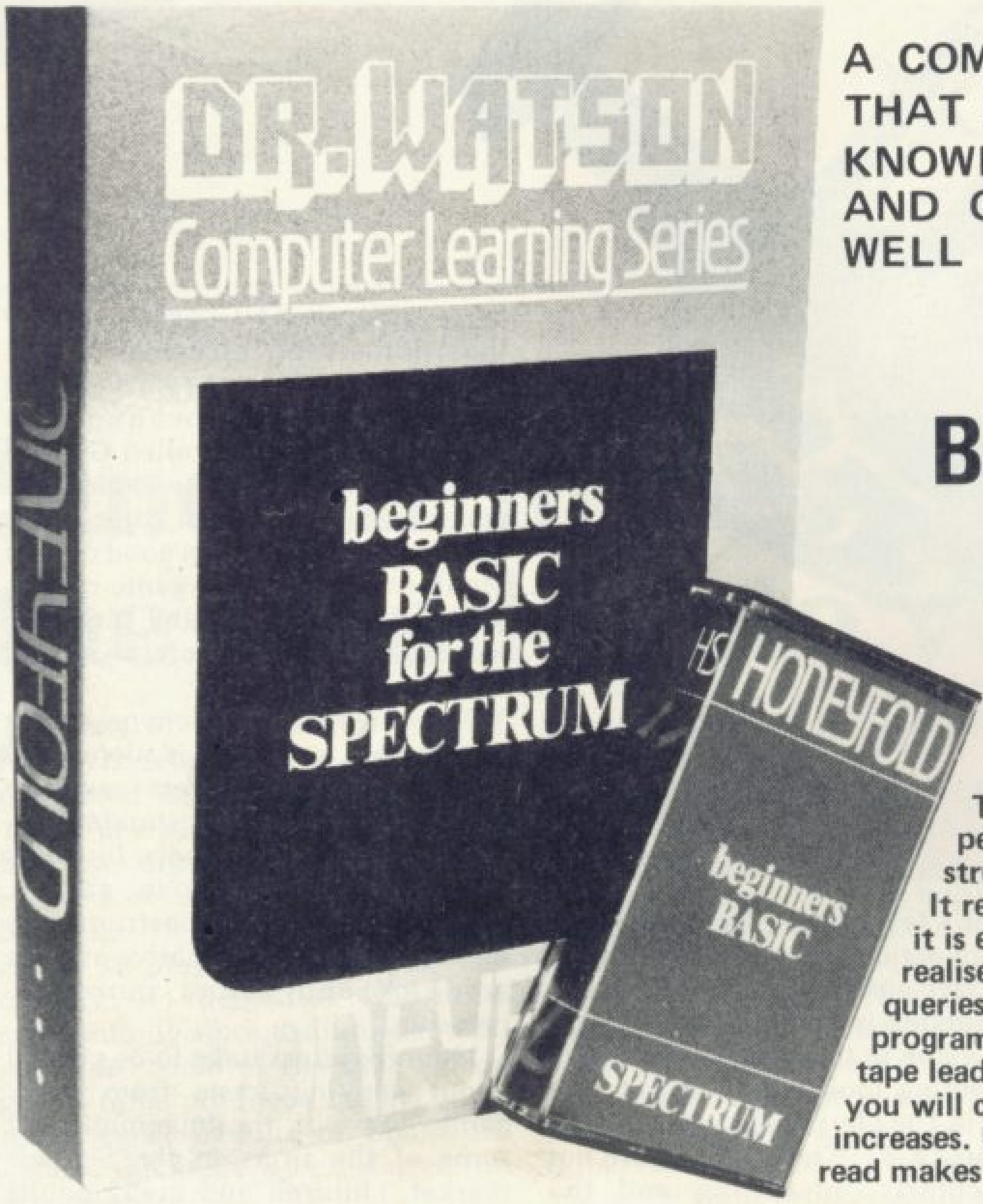
Quicksilva, 92 Northam Road, Southampton SO2 0PB.

Artic Computing, 396 James Reckitt Avenue, Hull, North Humberside.

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PROGRAM PRINTOUT



REAR GUNNER

REAR GUNNER is a program included specifically for the computer novice, to demonstrate the use of graphics mode and the manoeuvring of a display under cursor control.

The screen shows a graphic G, representing your target, and a plus sign which is your gunsight. Align the two with the cursor keys and blast your target to oblivion with 0. The program was sent by Andrew Tilbury of Hyde, Cheshire. (1K ZX-81).

```
  5 PAUSE 50
 10 LET A=5
 20 LET B=7
 30 LET C=INT (RND*26)
 40 LET D=INT (RND*17)
 50 PRINT AT D,C;"(graphic G)"
 60 PRINT AT A,B;" + "
 70 PRINT AT A-1,B;"   "
 80 PRINT AT A+1,B;"   "
 90 IF INKEY$="5" THEN LET B=B-1
100 IF INKEY$="8" THEN LET B=B+1
110 IF INKEY$="7" THEN LET A=A-1
120 IF INKEY$="6" THEN LET A=A+1
130 IF INKEY$="0" THEN GOTO 150
140 GOTO 50
150 IF D<>A THEN GOTO 50
160 IF C=B THEN GOTO 170
170 PRINT AT D-1,C;"(graphic
Y;SPACE;graphic T)"
180 PRINT AT D,C;"(SPACE;inverse
SPACE;SPACE)"
190 PRINT AT D+1,C;"(graphic
T;SPACE;graphic Y)"
200 RUN
```



FIRE TRAP

YOU ARE trapped in a burning spacecraft and must make your way to the exit before your oxygen runs out. Blocks of molten metal fall from the higher levels and land at random positions around you. With the cursor keys 5 to 8 you must dodge around them to the exit and thence to the next level of the ship, where you will be rewarded with 100 points and a fresh tank of oxygen.

Fire Trap is a simple but entertaining game which could easily be enlivened by some user-definable graphics. It was submitted by Howard Dowthwaite of Seaford, Sussex. (16K Spectrum).

```
  10 INK 7: PAPER 0: BORDER 0: c
LS : GO SUB 1000: LET e=50: LET
r=0: LET s=0
  20 DIM a$(21,31): CLS : LET c=
0: LET r=r+1: LET x=10: LET y=15
: LET e=e+25: LET m=INT (RND*28)
+2: LET n=INT (RND*18)+2
  30 PRINT AT x,y; INK 5;"+";AT
0,0; INK 7;"SCORE=";s; PAPER (e<
20)*2; FLASH (e<20);" OXYGEN=";e
; PAPER 0; FLASH 0;" level=";r;"
 "
  40 FOR b=1 TO 4: LET a$(n,m)=b
$: PRINT AT n,m; INK 5; PAPER 1;
b$: FOR a=1 TO 3: NEXT a: NEXT b
: PRINT AT x,y;" "
  50 LET f$=INKEY$
  60 IF a$(x,y-1)<>"■" AND f$="5
" AND y>2 THEN LET y=y-1
  70 IF a$(x,y+1)<>"■" AND f$="8
" AND y<39 THEN LET y=y+1
  80 IF a$(x+1,y)<>"■" AND f$="6
" AND x<20 THEN LET x=x+1
  90 IF a$(x-1,y)<>"■" AND f$="7
" AND x>2 THEN LET x=x-1
 100 IF n=x AND m=y THEN LET s=s
+100: PRINT AT 21,0;"WELL DONE !
!": FOR m=10 TO 40: BEEP .01,m:
NEXT m: GO TO 20
 110 IF e<=0 THEN PRINT AT 21,0;
"OUT OF OXYGEN : GAMEOVER": STOP

 120 LET e=e-1
 130 IF a$(x-1,y)="■" AND a$(x+1
,y)="■" AND a$(x,y-1)="■" AND a$
(x,y+1)="■" THEN PRINT AT 21,0;"
YOU ARE TRAPPED : GAMEOVER": STO
P
 140 IF f$="" THEN GO TO 30
 150 LET s=s+1
 160 LET rl=INT (RND*4)+1
 170 GO SUB (rl*10)+180
 180 GO TO 30
 190 LET a$(x-1,y)="■": BEEP .01
,40: PRINT AT x-1,y; INK 6;"■":
RETURN
 200 LET a$(x+1,y)="■": BEEP .01
,41: PRINT AT x+1,y; INK 3;"■":
RETURN
 210 LET a$(x,y-1)="■": BEEP .01
,42: PRINT AT x,y-1; INK 4;"■":
RETURN
 220 LET a$(x,y+1)="■": BEEP .01
,43: PRINT AT x,y+1; INK 5;"■":
RETURN
1000 LET b$="E"
1010 PRINT INK 2;"      FIRE
TRAP
"
1020 PRINT ,,,," You are in a bu
rning space-    craft. You are
the '+' and     you move by usi
ng the cursor   controls. Your
aim is to get   to higher level
s before you    run out of oxyg
en or get       trapped by the
blocks. After   every level you
 get 100 points and more oxygen
"
1030 FOR n=0 TO 200: NEXT n
1040 PRINT ,,"    Press any key t
o continue"
1050 PAUSE 0
1060 RETURN
```

BEETHOVEN

```
   1 REM 1234567890123456789012З
4567890123456789012345 44
   2 REM .......................
................................
................................
................................
................................
................................
  10 LET A$="... "
  20 LET A$=A$+"FFF"
  25 LET O=16567
  30 FOR I=1 TO LEN A$-1 STEP 2
  40 POKE O,(CODE A$(I)-28)*16+C
ODE A$(I+1)-28
  50 LET O=O+1
  60 NEXT I
  70 FAST
  80 LET K=USR 16546
  99 STOP
 100 SAVE "BEETHOVEn"
 110~PRINT "*******************
**************************BEETHOVE
N*********************************
************"
 120 PRINT ,,"PROGRAMME CREATED
BY S. CRAINIC FOR THE SINCLAIR Z
X81 +16K"
 130 PRINT ,,"EACH SOUND CORRESP
ONDS TO AN HE-XADECIMAL VALUE. I
N ORDER TO OB-TAIN THE DESIRED M
ELODY,YOU MUSTENTER SUCCESSIVELY
 IN LINE 10   (LET A$=""... ..."
") THE HEXADECI-MAL CODE OF EACH
 SOUND IN THEIR ORDER IN THE MEL
ODY."
 140~PRINT "THE SOUNDS HAVE EQUA
L LENGTHS. A LONGER DURATION OF
A GIVEN    SOUND COULD BE OBTAIN
ED BY ENTE-RING MANY TIMES SUCCE
SSIVELY THECODE CORRESPONDING.TO
 THE SAME  SOUND. INTERVALS ARE
OBTAINED BYENTERING THE ""00"" V
ALUE."
 145 PRINT AT 21,0;"HIT A KEY TO
 CONT."
 150 IF INKEY$="" THEN GOTO 150
 155 CLS
 160 PRINT " NOTE      1ST SCALE
   2ND SCALE---------------------
-------------"
 165 DIM B$(2,24)
 170 LET B$(1)="F0E5D8CFC3B8ADA5
9C948B83"
 175 LET B$(2)="7A736B67605A5651
4B484440"
 180~LET C$="C    C+;D-D    D+;E
-E    F    F+;G-G    G+;A-A    A
+;B-B    "
 190 FOR I=1 TO 12
 200 PRINT C$(I*5-4 TO I*5);TAB
11;B$(1,I*2-1 TO I*2);TAB 24;B$(
2,I*2-1 TO I*2)
 210 NEXT I
 220 PRINT ,,"AS EXAMPLES, SOME
MELODIES WERE CODED IN LINES 100
0...    IF YOU WANT TO ""PLAY"" O
NE OF THEM, EN- TER run 1000, OR
  1010...        )make the tone o
f your tv set    louder AND newli
ne."
 230 PRINT AT 21,0;"      HIT A KE
Y TO CONT "
 240 IF INKEY$="" THEN GOTO 240
 245 CLS
 247 PRINT "EXCUSE ME, I""M WORK
ING..."
 248 FOR I=1 TO 30
 249~NEXT I
 250 FAST
 255 RUN 9990
1000 REM happy birthday
1005 LET A$="B8B800B800A5A500B8B
8008B8B00949494940000B8B800B800A
5A500B8B8008B8B0094949494 00B8B80
0B800606060737373008B8B8B0094940
0A5A5A5006B6B006B737300949400838
300949494"
1009 GOTO 20
1010 REM 40th symphony
1011 LET A$="B8C300C3C300B8C300C
3C300B8C300C3C37A7A7A007A8394940
094A5B8B800B8C3D8D800D8D8D800C3D
800D8D8C3D800D8D800C3D800D8D8838
3830083949C9C009CB8C3C300C3D8F0F
000F0F0007A830083836B6B9C9C83839
494C3C3007A830083836B6B9C9C83839
4947A7A007A8394A5B8B8C3C3B8B8"
1019 GOTO 20
9989 STOP
9990~LET A$="7B3D20FDC906E05EAFB
B280CDBFECD8240D3FFCD824018050E0
50D20FD10E8C921B740CD8740237EFEF
F20F7C9"
9991 LET O=16514
9992 FOR I=1 TO LEN A$-1 STEP 2
9993 POKE O,(CODE A$(I)-28)*16+C
ODE A$(I+1)-28
9994 LET O=O+1
9996 NEXT I
9997 SLOW
9998 CLS
```



BEETHOVEN is a remarkable program which allows you to produce music from your ZX-81. Stephane Crainic of Paris has linked hex values to the tones available from the speaker of your television set and has produced a table allowing you to convert the notes of the musical scale into those values.

When you have typed-in the program, enter GOTO 110 so that you can read the instructions and the table of scales and hex codes. Then transpose your tune into hex. After reading the instructions and pressing keys to continue, the screen will show 0/9998.

Enter LIST 10, EDIT, and alter the A$ to the list of hex values into which you have converted your tune. Increase the volume of your TV, enter GOTO 1 and your tune will be produced. The notes produced are all off-key but the quality is certainly no worse than that available from the Spectrum. Lower-case letters in our listing signify inverse video (16K ZX-81).

THE CHILDREN are screaming, the flesh is toasting, it is a perfect day at the beach. You are the budding entrepreneur on the lemonade stand, trying to out-sell your rivals and lay the foundations of a fast food empire.

You start with capital of £25 and have to decide how much to spend on advertising, how much on stock and what price to charge for each glass.

Lemonade was submitted by N Beer of Exeter, Devon. Lower-case letters in the listing signify inverse video (16K ZX-81).



LEMONADE

```
278~PRINT "L   E   M   O   N
A   D   E"
279 PRINT "--------------------
---------"
280 PRINT AT 10,0;"DO YOU REQUI
RE INSTRUCTIONS ?          (Y/
N)"
290 LET A$=INKEY$
300 IF A$="Y" THEN GOTO 9000
310 IF A$="N" THEN GOTO 330
320 GOTO 290
330 CLS
340 PRINT AT 10,0;"HOW MANY PLA
YERS (2-4) ?"
350 INPUT P
360 IF P<2 OR P>4 THEN GOTO 350
361 CLS
362 PRINT AT 10,0;"HOW MANY DAY
S DO YOU WANT TO          PLAY
(MAX=14) ?"
363 INPUT AD
364~IF AD<1 OR AD>14 THEN GOTO
363
369 CLS
370 DIM M(P)
380 DIM A(P)
390 DIM R(P)
395 DIM L(P)
400 DIM B(P)
410 DIM Q(P)
420 DIM I(P)
430 FOR F=1 TO P
440 LET M(F)=25
450 NEXT F
460 FOR F=1 TO P
470 LET A(F)=0
480 NEXT F
490 FOR F=1 TO P
500 LET R(F)=0
510 NEXT F
520 FOR F=1 TO P
530 LET B(F)=0
531 NEXT F
532 FOR E=1 TO AD
533 PRINT "L   E   M   O   N   A   D
E   day  ";E;AT 2,0;"(thirty two
graphic 7s)"
534 LET W=INT (RND*4)
535 IF W=0 OR W=3 THEN LET W$="
sunny"
536 IF W=1 THEN LET W$="rain"
```

```
537 IF W=2 THEN LET W$="snow"
538 PRINT AT 10,10;W$
539 PRINT AT 15,0;"LEMONDSVILLE
WEATHER REPORT"
540 FOR U=1 TO 100
541 NEXT U
551 LET AP=INT (RND*3)+1
552 LET BP=INT ((RND*4)+1)*0.5
553 FOR F=1 TO P
560 CLS
570 PRINT "L   E   M   O   N
A   D   E"
571~PRINT ,,"(twenty nine graph
ic 7s)"
580 PRINT ,,,,,,"Player ";F
590 PRINT ,,,,"money £";M(F)
600 PRINT ,,,,"advertisements ?
                EACH BOARD COSTS
£";AP
610 INPUT A(F)
660 PRINT AT 12,15;A(F)
670 PRINT AT 13,0;"
                "
680 LET M(F)=M(F)-(A(F)*AP)
690 PRINT AT 9,7;M(F);"  "
700 PRINT AT 15,0;"bottles ?
                EACH BOTTLE
MAKES 10 GLASSES"
710 PRINT "BOTTLES COST £";BP
720 INPUT B(F)
770 PRINT AT 15,8;B(F)
775 LET M(F)=M(F)-(B(F)*BP)
790 PRINT AT 9,7;M(F);"  "
800~PRINT AT 16,0;"


                Price of lem
onade per glass ?   IN PENCE"
810 INPUT L(F)
820 LET L(F)=INT ABS L(F)
830 PRINT AT 18,28;L(F);"P"
835 PRINT AT 19,0;"              "
840 FOR T=1 TO 100
850 NEXT T
860 NEXT F
870 IF W$="sunny" THEN LET G=17
5
880 IF W$="rain" THEN LET G=75
890 IF W$="snow" THEN LET G=10
900 CLS
910 PRINT "L   E   M   O   N   A   D
E   day  ";E
```






```
920 PRINT ,,"(thirty two graphi
c 7s)"
921 PRINT AT 6,9;W$
925 LET V=INT (RND*50)+G
930 PRINT AT 6,9;W$
940 PRINT AT 10,0;"TODAY THERE
WERE ";V;" VISITORS"
950 FOR U=1 TO 125
960 NEXT U
970 CLS
980 DIM S(P)
990 FOR C=1 TO P
1000 LET Q(C)=(B(C)*10)
1010 NEXT C
1020 FOR C=1 TO P
1030 LET I=V*10
1040 LET S(C)=I/L(C)
1050 IF L(C)>30 AND L(C)<=50 THE
N LET S(C)=INT (RND*(V/(V-2)))
1060 IF L(C)>50 THEN LET S(C)=0
1070 LET Z=(RND*(A(C)*5))
1080 LET S(C)=S(C)+(Z*2)
1085 LET S(C)=INT (S(C)*0.75)
1090 NEXT C
1095 LET N=0
1100 FOR O=1 TO P
1110 LET N=N+S(O)
1120 NEXT O
1130 IF N>V THEN LET M=N-V
1140 IF N>V THEN LET M=INT (M/P)
1150 IF N>V THEN FOR Y=1 TO P
1160 IF N>V THEN LET S(Y)=S(Y)-M
1170 IF N>V THEN NEXT Y
1180 FOR H=1 TO P
1190 IF S(H)>Q(H) THEN LET S(H)=
Q(H)
1195 IF S(H)<0 THEN LET S(H)=0
1196 IF S(H)>V THEN LET S(H)=V
1200 NEXT H
1210 FOR J=1 TO P
1220 PRINT "L   E   M   O   N
A   D   E"
1230 PRINT ,,"(twenty nine graph
ic 7s)"
1241 LET MY=INT (S(J)*L(J))/100
1242 LET M(J)=M(J)+MY
1250 PRINT ,,,,"player ";J;"
  money £";M(J);"     "
1260 PRINT ,,,,"you sold ";S(J);
" glasses"
1265 PRINT ,,,,"you had enough l
emonade for ";Q(J)
1266 PRINT ,,,,"Price of lemonad
e Per glass ";L(J);"P"
1267 PRINT ,,,,"advertisements "
;A(J)
1270 PRINT ,,,,"Profit £";MY-BP*
B(J)-AP*A(J)
1280 FOR U=1 TO 100
1290 NEXT U
1300 CLS
1310 NEXT J
1320 NEXT E
1330 GOSUB 10
1335 PRINT AT 5,19;
1340 FOR U=1 TO P
1345 PRINT TAB 19;"Player ";CHR$
(U+156)
1350 PRINT TAB 21;"£";M(U)
1360 PRINT
1365 PRINT
1370 NEXT U
1380 PRINT AT 3,0;"ANOTHER GAME
(Y OR N) ?"
1390 LET X$=INKEY$
1400 IF X$="Y" THEN GOTO 330
1410 IF X$="N" THEN STOP
1420 GOTO 1390
8998 SAVE "LEMONADe"
8999 RUN
9000 CLS
9010 PRINT "   L  E  M  O  N  A
 D  E"
9020 PRINT ,,,,,,"THE OBJECT OF
THIS GAME IS TO   MAKE AS MUCH M
ONEY (£) AS       POSSIBLE."
9025 PRINT "YOU OWN A STALL NEAR
 A BEACH IN THE RESORT OF LEMOND
SVILLE.YOU  SELL LEMONADE AND TR
Y TO MAKE A PROFIT.TO START WITH
 YOU HAVE   £25 TO BUY LEMONADE
FROM THE    WHOLE-SALER."
9030 PRINT "YOU CAN ALSO ADVERTI
SE YOUR     LEMONADE BUT IT ALL
COSTS MONEY."
9040 PRINT AT 21,0;"PRESS ANY KE
Y"
9050 IF INKEY$="" THEN GOTO 9050
9060 GOTO 330
9500 FOR F=1 TO 5
9510 NEXT F
9520 RETURN
```

Poker Dice

THE OBJECT of **Poker Dice** is to throw five dice to get the best hand. Each player in turn throws all five dice by entering his name and pressing NEWLINE. He may then seek to improve his hand by entering the numbers of any dice with which he is dissatisfied. He can do so only once.

If the player does not wish to throw again, "0" will pass the play to his opponent. Poker Dice was submitted by John South of Bexhill-on-Sea, East Sussex (1K ZX-81).

```
  10 RAND
  20 LET A$="NINE TEN  JACK QUEE
NKING ACE  "
  30 LET A=0
  40 LET B$="12345"
  50 PRINT AT 3,A;"NAME?"
  60 INPUT C$
  70 PRINT AT 3,A;C$;"  "
  80 GOSUB 170
  90 PRINT AT 16,7;"THROW AGAIN?
"
 100 INPUT B$
 110 PRINT AT 16,7;"
"
 120 IF B$="0" THEN GOTO 140
 130 GOSUB 170
 140 LET A=A+8
 150 IF A=32 THEN STOP
 160 GOTO 40
 170 FOR N=1 TO LEN B$
 180 LET B=INT (RND*6+1)*5
 190 PRINT AT 3+2*VAL B$(N),A;B$
(N);A$(B-4 TO B)
 200 NEXT N
 210 RETURN
 220 SAVE "PD"
 230 RUN
```



RAINBOW RIOT



MANY pattern generator programs are submitted to *Sinclair User*. **Rainbow Riot** is one which particularly appealed to us, creating a symmetrical coloured pattern on your TV screen. The program was submitted by G R Stevens of Oakworth, West Yorkshire (16K Spectrum).

```
  10 RANDOMIZE : BORDER 0: PAPER
 0: INK 7: OVER 1
  20 LET d=15: DIM a(d,3)
  30 LET y1=84: LET x1=123: PRIN
T AT 10,12;"THINKING"
  40 REM Create basic form
  50 FOR b=1 TO d
  60 LET x=213-INT (RND*426): LE
T y=175-INT (RND*350)
  70 IF x1+x>213 OR y1+y>168 OR
x1+x<38 OR y1+y<=0 THEN GO TO 60
  80 LET c=6*RND*(1-2*(y1>84 AND
 x<0 OR y1<84 AND x>0)): LET c=c
*2/(2+(ABS c>4)*(ABS x>20 OR ABS
 y>20)+2*(ABS x>50 OR ABS y>50))
  90 LET x1=x1+x: LET y1=y1+y: L
ET a(b,1)=x: LET a(b,2)=y: LET a
(b,3)=c
 100 NEXT b
 110 REM Display pattern
 120 CLS : FOR a=-1 TO 1 STEP 2:
 FOR c=-1 TO 1 STEP 2
 130 PLOT 123,84
 140 FOR b=1 TO d
 150 DRAW a*a(b,1),c*a(b,2),a*c*
a(b,3)
 160 NEXT b
 170 NEXT c: NEXT a
 180 REM Set colours
 190 LET p=0: LET c=22695: FOR a
=0 TO 352 STEP 32: FOR b=0 TO 13
 200 LET at=INT (6*RND)
 210 LET at=at+5*(at<2)+64
 220 POKE c+b+a,at: POKE c+b-a,a
t: POKE c-b+a,at: POKE c-b-a,at
 230 NEXT b: NEXT a
```

VARIABLE LISTER

VARIABLE LISTER for the Spectrum is placed at the end of a program and after the program is run it will list all the variables, i.e., string, string array, numeric, FOR. . .TO.

Your program must be RUN first and you should make sure that the variable routine is not RUN during execution of your main program. When you want to see what variables are contained in your program, type GOTO 9990 and they will be listed.

This handy program was sent by Philip Taglione of Bradford, West Yorkshire.

```
9990 FOR N=PEEK 23627+256*PEEK 2
3628 TO PEEK 23641+256*PEEK 2364
2-2
9991 IF PEEK N>224 THEN PRINT "F
OR TO NEXT ";CHR$ (PEEK N-128):
LET N=N+18: GO TO 9999
9992 IF PEEK N>192 THEN PRINT "S
TRING ARRAY",CHR$ (PEEK N-96);"$
": LET N=N+2+PEEK (N+1)+256*PEEK
 (N+2): GO TO 9999
9993 IF PEEK N<97 THEN PRINT "ST
RING",CHR$ (PEEK N+32);"$": LET
N=N+2+PEEK (N+1)+256*PEEK (N+2):
 GO TO 9999
9994 IF PEEK N<123 THEN PRINT "N
UMBER",CHR$ (PEEK N): LET N=N+5:
 GO TO 9999
9995 IF PEEK N<155 THEN PRINT "N
UMBER ARRAY",CHR$ (PEEK N-32): L
ET N=N+2+PEEK (N+1)+256*PEEK (N+
2): GO TO 9990
9996 PRINT ,"NUMBER",CHR$ (PEEK
N-64);
9997 LET N=N+1: IF PEEK N<128 TH
EN PRINT CHR$ (PEEK N);: GO TO 9
997
9998 PRINT CHR$ (PEEK N-128): LE
T N=N+5
9999 NEXT N
```



MADMAZE is a beat-the-clock game requiring you to reach the end of a complex maze in the shortest possible time. You are represented by an inverse asterisk and your movements are controlled by keys 5 to 8. If you touch a wall you are returned to the start. There is a high-score facility.

The maze is partly random and partly programmed so that it is always new but never blocked. **Mad Maze** was submitted by David Hall, of Wellingborough, Northamptonshire.

In our listing, lower-case letters signify inverse video unless enclosed by brackets, in which case they are graphic instructions. In lines 9920 to 9995, all SPACEs are inverse and all As are in graphic mode. (ZX-81 approximately 2½ K).

```
   1 REM "MAD MAZE"
   2 LET H$=""
   3 LET H=1000
   4 GOSUB 9900
   5 LET Z=0
   6 PRINT AT 1,20;"TIME: "
   7 PRINT AT 19,0;"low time=";H" BY ";H$
   8 PRINT AT 21,10;"counting"
  10 LET Y=0
  15 LET X=4
  20 PRINT AT X,Y;"(inverse ASTERISK)"
  30 LET Z=Z+1
  35 PRINT AT 1,27;Z
  40 IF INKEY$="" THEN GOTO 30
  50 PRINT AT X,Y;"(inverse SPACE)"
  60 LET X=X+(INKEY$="6")-(INKEY$="7")
  70 LET Y=Y+(INKEY$="8")-(INKEY$="5")
  80 PRINT AT X,Y;
  90 LET A=PEEK (PEEK 16398+256*PEEK 16399)
 100 IF A<>128 THEN GOTO 160
 110 PRINT AT X,Y;"(inverse ASTERISK)"
 120 IF INKEY$="I" THEN GOTO 350
 130 GOTO 20
 160 IF A=8 THEN GOTO 10
 170 PRINT AT 21,10;"you escaped"
 200 PAUSE 4E4
 210 CLS
 220 IF Z<H THEN GOTO 240
 230 GOTO 280
 240 PRINT "YOU HAVE SET A NEW LOWEST TIME,","PLEASE ENTER YOUR NAME:-";
 250 INPUT H$
 260 PRINT H$
 265 LET H=Z
 270 GOTO 300
 280 PRINT "SORRY YOU FAILED TO BEAT",H$
 300 PRINT ,,,,"ANOTHER GO (Y/N)?"
 310 INPUT Q$
 320 IF Q$="Y" THEN GOTO 4
 330 STOP
 350 CLS
 360 PRINT "I AM SORRY IT WAS IMPOSSIBLE"
 370 GOTO 300
9900 CLS
9905 PRINT "MAD MAZE"
9910 PRINT
9915 PRINT
9920 PRINT "(32*A)"
9925 PRINT "(6*SPACE;5*A;4*SPACE;6*A;9*SPACE;2*A)"
9930 PRINT "(3*A;SPACE;A;7*SPACE;2*A;3*SPACE;4*A;SPACE;2*A;SPACE;2*A;SPACE;A;2*SPACE;A)"
9935 PRINT "(3*A;3*SPACE;3*A;SPACE;6*A;SPACE;4*A;SPACE;2*A;SPACE;2*A;SPACE;2*A;SPACE;A)"
9940 PRINT "(3*A;SPACE;A;SPACE;3*A;16*SPACE;2*A;SPACE;2*A;SPACE;A)"
9945 PRINT "(2*A;2*SPACE;A;SPACE;5*A;SPACE;4*A;SPACE;2*A;SPACE;7*A;4*SPACE;A)"
9950 PRINT "(2*A;SPACE;2*A;SPACE;4*A;5*SPACE;A;6*SPACE;2*A;4*SPACE;2*A;SPACE;A)"
9955 PRINT "(2*A;SPACE;2*A;4*SPACE;A;SPACE;3*A;SPACE;4*A;SPACE;A;2*SPACE;A;SPACE;5*A;SPACE;A)"
9960 PRINT "(2*A;SPACE;5*A;3*SPACE;3*A;6*SPACE;2*A;SPACE;A;6*SPACE;A)"
9965 PRINT "(A;8*SPACE;5*A;SPACE;4*A;6*SPACE;4*A;SPACE;2*A)"
9970 PRINT "(A;SPACE;6*A;SPACE;2*A;4*SPACE;9*A;SPACE;2*A;3*SPACE;2*A)"
9975 PRINT "(A;SPACE;3*A;4*SPACE;2*A;SPACE;A;SPACE;4*A;10*SPACE;A;SPACE;2*A)"
9980 PRINT "(A;5*SPACE;5*A;SPACE;A;6*SPACE;4*A;SPACE;3*A;SPACE;A;SPACE;2*A)"
9985 PRINT "(5*A;7*SPACE;6*A;SPACE;A;8*SPACE;A;SPACE;2*A)"
9990 PRINT "(11*A;10*SPACE;6*A;4*SPACE;inverse O)"
9991 PRINT "(32*A)"
9992 FOR N=1 TO 20
9993 LET J=INT (RND*30)+1
9994 LET K=INT (RND*12)+5
9995 PRINT AT K,J;"(A)"
9996 NEXT N
9999 RETURN
```

DATA FILE

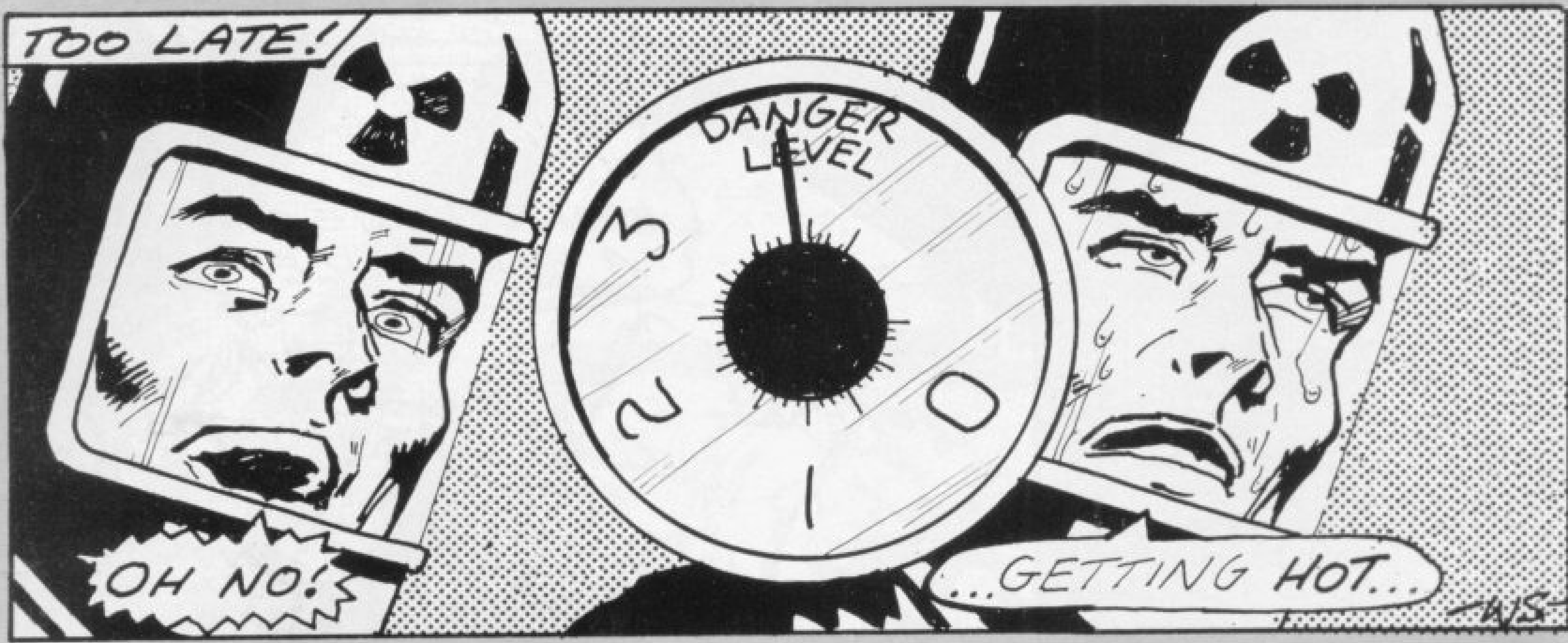


DATA FILE for the 16K Spectrum will store 800 items with a maximum of 32 characters each. When all the data has been entered, a menu will appear on the screen, giving you several choices of action.

You can add another item to the file, search for items already entered, save, load or list a file. To change the complete file you would enter option 7.

The program was sent by P C Forrister of Romford, Essex. He suggests that it may help beginners if they worked through the listing to see how it works. We agree that is a good idea.

```
   1 REM DATA STORING & SORTING
PROGRAM/P.C.FORRISTER*22-11-82*
   5 POKE 23609,200: BORDER 0: I
NK 7: PAPER 0: DIM A$(800,32): L
ET E=1
   6 REM 800 FILES/32 CHARACTERS
.LOWER THE 800 IF USING 16K
   9 REM ENTER DATA
  10 PRINT FLASH 1; INK 5; PAPER
 1;AT 0,0;"ENTER DATA FILE No";E
';"ENTER (E1 OR e1) TO END ENTER
YS"
  20 INPUT A$(E): IF A$(E)="E1
                              " OR
 A$(E)="e1
          " THEN LET A$(E)="   ": G
O TO 100
  30 PRINT PAPER 0; INK 4;AT 19,
0;A$(E): LET E=E+1: GO TO 10
  99 REM SORT FILES INTO ALPHABE
TICAL ORDER/NUMBERS ARE LOWER TH
AN LETERS
 100 CLS : PRINT FLASH 1; INK 2;
 PAPER 7;AT 0,6;"STAND BY-SORTIN
G"
 110 FOR B=1 TO E-1: FOR C=B+1 T
O E-1
 120 IF A$(B)<=A$(C) THEN GO TO
140
 130 LET D$=A$(B): LET A$(B)=A$(
C): LET A$(C)=D$
 140 NEXT C
 150 NEXT B
 199 REM PRINT MENU
 200 PRINT INK 0; PAPER 4;AT 0,5
;"SORTING COMPLETE": FOR H=-10 T
O 10: BEEP .1,H: NEXT H: LET E=E
-1: CLS
 210 PRINT INK 2; PAPER 6;AT 0,0
;"1 TO END                 "'"2 TO A
DD ANOTHER FILE"'"3 TO SEARCH     "
          "'"4 TO SAVE FILES
'"5 TO LOAD FILES          "'"6 TO L
IST FILES          "'"7 TO CHANGE A
FILE     "
 220 IF INKEY$="" THEN GO TO 220
 225 IF INKEY$="1" THEN CLS : PR
INT FLASH 1; INK 4; PAPER 0;"DO
YOU WISH TO STOP THE PROGRAM ENT
ER Y OR N ?": INPUT B$: IF B$="Y
" THEN STOP
 230 IF INKEY$="2" THEN CLS : GO
 TO 10
 235 IF INKEY$="3" THEN GO TO 10
00
 240 IF INKEY$="4" THEN GO TO 20
00
 245 IF INKEY$="5" THEN GO TO 30
00
 250 IF INKEY$="6" THEN GO TO 40
00
 255 IF INKEY$="7" THEN GO TO 50
00
 260 CLS : GO TO 210
 999 REM SEARCH
1000 CLS : PRINT FLASH 1; INK 7;
 PAPER 3;AT 10,0;"ENTER FILE TO
BE SEARCHED FOR": LET F=E
1010 INPUT Z$
1020 IF Z$=A$(F)( TO LEN Z$) THE
N CLS : PRINT FLASH 1; INK 1; PA
PER 6;AT 10,10;"FILE FOUND"'';A$
(F): GO TO 210
1030 IF F>1 THEN LET F=F-1: GO T
O 1020
1040 CLS : PRINT FLASH 1; INK 2;
 PAPER 7;AT 10,7;"FILE NOT IN ME
MORY": GO TO 210
1999 REM SAVE DATA A$ ON TAPE 3
TIMES
2000 FOR V=0 TO 2: CLS : PRINT F
LASH 1; PAPER 5; INK 1;AT 0,0;"S
AVING DATA A$": SAVE "DATA" DATA
 A$(): NEXT V
2010 CLS : PRINT FLASH 1; INK 6;
 PAPER 1;"SAVE COMPLETE": GO TO
210
2999 REM LOAD DATA A$ FROM TAPE
3000 CLEAR : PRINT FLASH 1; INK
0; PAPER 6;AT 0,10;"LOADING DATA
 A$": LOAD "DATA" DATA A$()
3999 REM NEVER PRESS (N) WHEN AS
KED SCROLL?
4000 LET E=1
4010 IF A$(E)="
               " THEN PRINT FLAS
H 1; INK 6; PAPER 1;"LIST COMPLE
TE": GO TO 210
4020 PRINT A$(E);"No-";E;CHR$ 94
: LET E=E+1: GO TO 4010
4999 REM CHANGE A FILE
5000 CLS : PRINT FLASH 1; INK 1;
 PAPER 7;AT 10,0;"ENTER FILE NUM
BER TO BE CHANGED": INPUT X: CLS
- : PRINT FLASH 1; INK 1; PAPER 7
;AT 10,0;"ENTER NEW FILE": INPUT
 A$(X): PRINT FLASH 1; INK 1; PA
PER 7;AT 10,0;"PRESS 0 TO CHANGE
 ANOTHER FILE"
5010 IF INKEY$="" THEN GO TO 501
0
5020 IF INKEY$="0" THEN GO TO 50
00
5030 GO TO 100
```




```
   2 GOTO 3000
   5 LET MOVES=0
   6 FAST
   7 LET DL=8
  10 GOSUB 1000
  15 SLOW
  17 PRINT AT 21,23;"moves"
  19 PRINT AT 21,29;MOVES
  20 PRINT AT 21,4;"FROM ";
  30 INPUT I$
  40 PRINT I$;
  50 PRINT " TO ";
  60 INPUT U$
  70 PRINT U$
  80 LET MOVES=MOVES+1
  90 PRINT AT 21,29;MOVES
 100 LET I=CODE I$-28
 110 LET U=CODE U$-28
 112 REM check entry is valid
 115 IF U=I-5 OR U=I-1 OR U=I+1
OR U=I+5 THEN GOTO 120
 117 GOTO 500
 120 LET I$=A$(I)
 125 IF I$(5)=C$(6) THEN GOTO 50
0
 130 LET U$=A$(U)
 135 IF U$(5)<>C$(6) THEN GOTO 5
00
 140 LET X=VAL I$(1 TO 2)
 150 LET Y=VAL I$(3 TO 4)
 160 PRINT AT X,Y;C$(6)
 170 LET X=VAL U$(1 TO 2)
 180 LET Y=VAL U$(3 TO 4)
 190 PRINT AT X,Y;I$(5)
 200 LET A$(U,5)=A$(I,5)
 205 LET A$(I,5)=C$(6)
 210 GOSUB 2000
 220 GOTO 17
 500 PRINT AT 21,0;"invalid entr
ydPress any key      "
 510 PAUSE 4E4
 520 PRINT AT 21,0;"
                               "
 522 LET MOVES=MOVES-1
 530 GOTO 17
 999 REM set up board
1000 LET F$="(graphic 8;3*A;3*SP
ACE;3*A;3*SPACE;3*A;3*SPACE;3*A;
3*SPACE;3*A;graphic 5)"
1010 LET G$="(graphic 8;3*SPACE;
3*inverse SPACE;3*SPACE;3*invers
e SPACE;3*SPACE;3*inverse SPACE;
3*SPACE;3*inverse SPACE;3*SPACE;
graphic 5)"
1020 FOR F=1 TO 18 STEP 6
1030 PRINT F$,F$,F$
1040 PRINT G$,G$,G$
1050 NEXT F
1060 PRINT F$,F$,F$
1065 LET Z=1
1070 FOR F=0 TO 19 STEP 6
1080 FOR N=1 TO 26 STEP 6
1090 PRINT AT F,N;CHR$ (Z+156)
1100 LET Z=Z+1
1110 NEXT N
1120 NEXT F
1499 REM place rods
1500 DIM A$(20,5)
1505 DIM C$(6)
1510 LET C$(1)="Z"
1520 LET C$(2)="Y"
1530 LET C$(3)="X"
1540 LET C$(4)="W"
1550 LET C$(5)="(inverse ASTERIS
K)"
1560 LET C$(6)=" "
1565 LET C=1
1569 REM position and rods set
1570 FOR F=2 TO 18
1580 LET A$(F,5)=C$(C)
1585 LET C=C+1
1590 IF C<1 OR C>4 THEN LET C=1
1600 NEXT F
1610 LET A$(1,5)=C$(6)
1615 LET A$(19,5)=C$(6)
1620 LET A$(20,5)=C$(5)
1625 LET M=1
1630 FOR F=1 TO 19 STEP 6
1640 FOR N=2 TO 26 STEP 6
1650 PRINT AT F,N;A$(M,5)
1660 LET M=M+1
1670 NEXT N
1680 NEXT F
1700 LET L=1
1710 FOR F=1 TO 20 STEP 6
1720 FOR N=2 TO 26 STEP 6
1730 LET A$(L,1 TO 2)=STR$ F
1740 LET A$(L,3 TO 4)=STR$ N
1750 LET L=L+1
1760 NEXT N
1770 NEXT F
1780 LET D$=" **DANGER LEVEL**"
1785 LET L$=" 3     2     1     0"
```



NUCLEAR WASTE

JOSEPH DONNELLY of Dublin has sent a fascinating game which involves moving a spent fuel rod from a nuclear reactor. The display shows the reactor from above, with different types of fuel rod arranged in a chessboard pattern.

The active rods must be manoeuvred so as to allow the passage of the spent rod, but active rods of the same type may not be placed too close without the imminent risk of contamination. A guage at the side of the screen shows the danger level you have reached.

The game as listed is extremely difficult but could be made easier by omitting lines 115 and 117, which would allow diagonal moves, or by dropping line 210, which would mean that there was no restriction on the proximity of active rods.

In our listing, lower-case letters signify inverse video except when inside brackets, in which case they are graphic instructions. In line 1000, all As are graphic As (16K Spectrum).

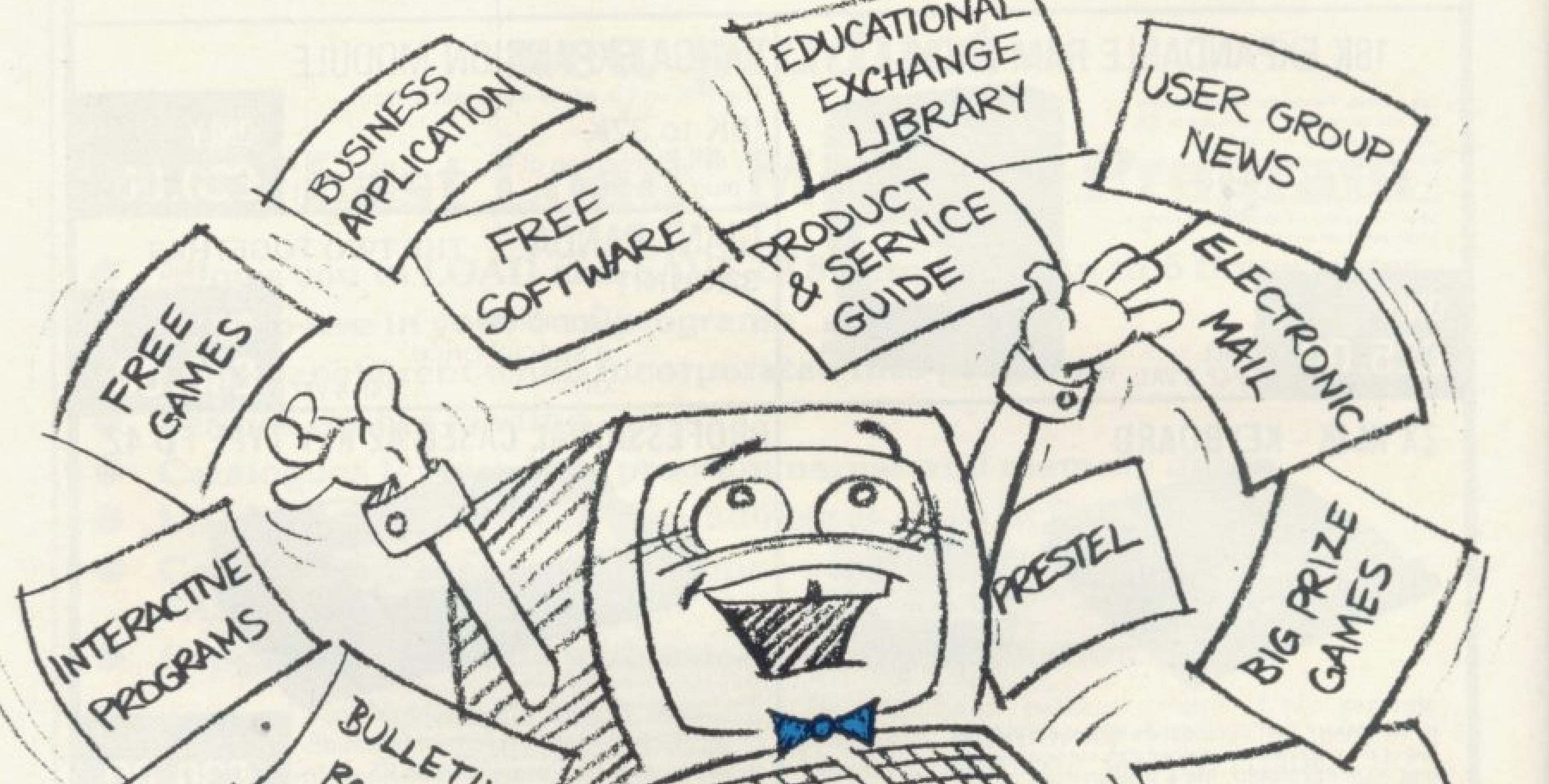
```
1790 FOR L=1 TO LEN D$
1800 PRINT AT L,29;D$(L);" ";L$(
L)
1810 NEXT L
1820 RETURN
1999 REM goto check boxes
2000 IF U=7 OR U=8 OR U=9 OR U=1
2 OR U=13 OR U=14 THEN GOTO 2200
2010 IF U=17 OR U=18 OR U=19 THE
N GOTO 2210
2020 IF U=2 OR U=3 OR U=4 THEN G
OTO 2220
2030 IF U=6 OR U=11 THEN GOTO 22
30
2040 IF U=10 OR U=15 THEN GOTO 2
240
2050 IF U=1 THEN GOTO 2250
2060 IF U=5 THEN GOTO 2260
2070 IF U=17 THEN GOTO 2270
2080 IF U=20 THEN GOTO 2280
2090 RETURN
2199 REM check boxes left right
up and down
2200 IF A$(U,5)=A$(U-5,5) OR A$(
U,5)=A$(U-1,5) OR A$(U,5)=A$(U+1
,5) OR A$(U,5)=A$(U+5,5) THEN GO
TO 2500
2205 RETURN
2210 IF A$(U,5)=A$(U-5,5) OR A$(
U,5)=A$(U-1,5) OR A$(U,5)=A$(U+1
,5) THEN GOTO 2500
2215 RETURN
2220 IF A$(U,5)=A$(U-1,5) OR A$(
U,5)=A$(U+1,5) OR A$(U,5)=A$(U+5
,5) THEN GOTO 2500
2225 RETURN
2230 IF A$(U,5)=A$(U-5,5) OR A$(
```

```
2275 RETURN
2280 IF A$(U,5)=A$(U-5) OR A$(U,
5)=A$(U-1,5) THEN GOTO 2500
2285 RETURN
2499 REM plot danger level
2500 FOR F=DL TO DL+10
2505 IF F>40 THEN GOTO 2530
2510 PLOT 60,F
2515 NEXT F
2520 LET DL=DL+10
2525 IF DL<39 THEN RETURN
2530 CLS
2540 PRINT AT 11,2;"YOU TOOK ";M
OVES;" MOVES AND DIED"
2550 PRINT AT 13,6;"PRESS ANY KE
Y."
2560 PAUSE 4E4
2565 CLS
2570 GOTO 5
2999 REM instructions
3000~PRINT AT 0,6;"NUCLEAR WASTE
"
3010 PRINT AT 2,0;"THE OBJECT IS
 TO TRY AND MOVE   THE (inverse
ASTERISK) AT BOX K TO THE EMPTY
BOX AT 1. YOU MAY MOVE ONE BOX U
P "
3020 PRINT AT 5,0;"DOWN LEFT OR
RIGHT BUT NOT MORE THEN ONE BOX
OR DIAGONAL."
3030 PRINT AT 8,0;"THE BLACK BOX
ES ARE TO KEEP RODSOF THE SAME T
YPE FROM REACTING  WITH EACH OTH
ER. WHEN MOVING"
3040 PRINT AT 11,0;"TRY TO KEEP
RODS OF THE SAME     TYPE IN DIAG
```

```
 205 LET A$(I,5)=C$(6)
 210 GOSUB 2000
 220 GOTO 17
 500 PRINT AT 21,0;"invalid entr
ydPress any key      "
 510 PAUSE 4E4
 520 PRINT AT 21,0;"
                          "
 522 LET MOVES=MOVES-1
 530 GOTO 17
 999 REM set uP board
1000 LET F$="(9raPhic 8;3*A;3*SP
ACE;3*A;3*SPACE;3*A;3*SPACE;3*A;
3*SPACE;3*A;9raPhic 5)"
1010 LET G$="(9raPhic 8;3*SPACE;
3*inverse SPACE;3*SPACE;3*invers
```

```
1640 FOR N=2 TO 26 STEP 6
1650 PRINT AT F,N;A$(M,5)
1660 LET M=M+1
1670 NEXT N
1680 NEXT F
1700 LET L=1
1710 FOR F=1 TO 20 STEP 6
1720 FOR N=2 TO 26 STEP 6
1730 LET A$(L,1 TO 2)=STR$ F
1740 LET A$(L,3 TO 4)=STR$ N
1750 LET L=L+1
1760 NEXT N
1770 NEXT F
1780 LET D$=" **DANGER LEVEL**"
1785 LET L$=" 3    2    1    0"
```

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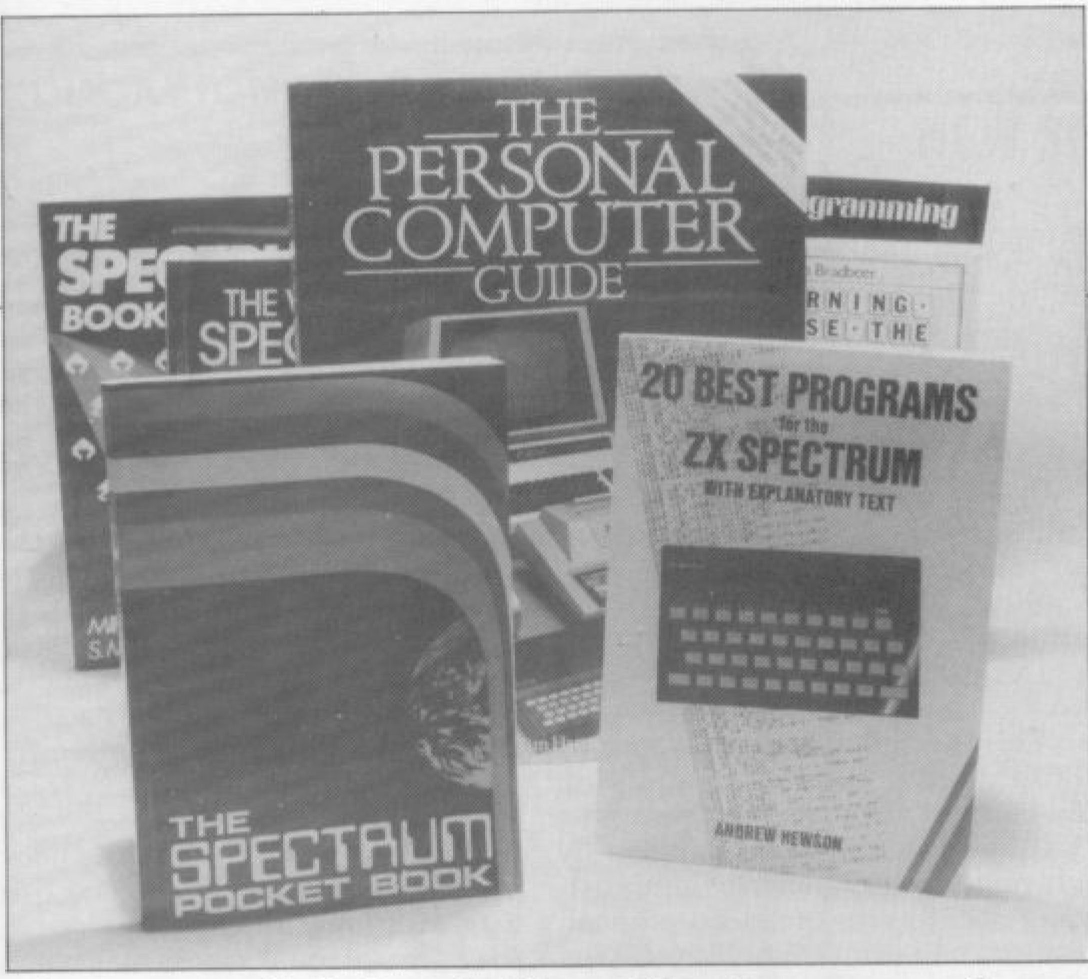
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This month John Gilbert looks away from the specific Sinclair publications

More information in general books

MANY GENERAL computer books, not written specifically for Sinclair machines, are so often useful to Sinclair users or other prospective computer owners. *The Personal Computer Guide*, by Tim Hartnell, provides information on most of the computers available. The guide is split into several sections, with a buyers' guide as an appendix to the computer reviews section.

The computer reviews contain short sections on the general appearance of each computer, approximate price, best and worst features. Hartnell draws some definite conclusions on the performance of each machine.

The guide includes a chapter on the history of computing from the days of Babbage to the present microcomputer boom. There is also a section on computer programming and how to use Basic.

One novel feature is that it has advertisements for a variety of machines, software and add-ons. The book also includes a list of clubs and local organisations which the computer owner can join.

The Personal Computer Guide contains everything a first-time buyer or beginner to computing might need. It is excellent value at £5.95 and can be obtained from Virgin Books.

Computing is Easy, by David Parker and Martin Hann, is an easy introduction to computing. There are many simple programs ready to be typed-in and it is ideal for the young user. A series of cartoons illustrates the book. They explain the concepts and, on occasions, are very amusing.

It has a chapter of debugging exercises, so that the beginner can become accustomed to the types of problem which occur during programming.

At the end of the book various topics are suggested to the programmer, such as currency conversion and composing tunes. The authors leave the programming of those tasks to the user. It is published by Newnes Technical Books and costs £4.95.

The Working Spectrum, by David Lawrence, is the handiest book about the Sinclair computer to appear so far. It charts the design of a series of routines, such as a filing system, an accounting program, a banking program and a graphic designer.

Each of the programs includes a discussion on how it works and the various techniques used, such as sorting and searching in the filing program. Each of the routines has been designed so that they can be used separately or in your own programs.

The book covers business uses, education and, of course, games. On the cover it indicates that it is volume one and I look forward to seeing the rest of the series. *The Working Spectrum* costs £5.95 and is published by Sunshine Books.

The Spectrum Pocket Book is another new book which can be recommended. It is more general than the previous book in the series, which was for the ZX-81, and includes a large section on machine code, which shows, among other things, how to print on to the screen using a machine code program and the Spectrum ROM.

There is also a full assembler program, disassembler and machine code monitor. It provides much useful information on the internal workings of the machine.

It is ideal both for first-time users and a user who has had some previous experience. It costs £4.95 and can be obtained from Phipps Associates.

'The Spectrum Pocket Book can be recommended. It is ideal for the first-time users and one with experience'

continued on page 84



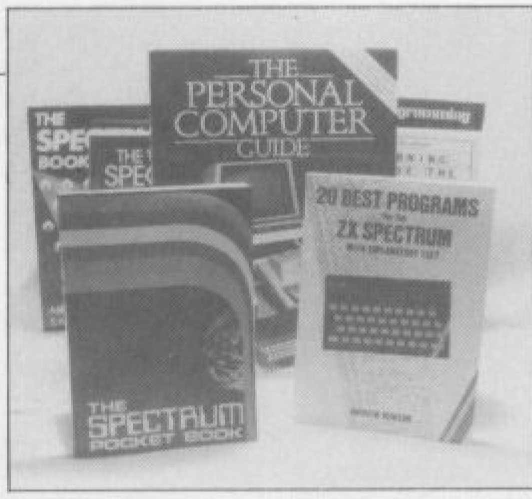
continued from page 83

Andrew Hewson has launched into the Spectrum market with *20 Best Programs for the ZX Spectrum*. The book includes mathematical, graphics and games programs, with information on how they work and how they were written.

It is excellent value at £5.95 and illustrates many programming techniques, including data filing, sorting and binary search.

Easy Programming for the ZX Spectrum, by Ian Stewart and Robin Jones, is another introductory text which can be recommended for the beginner. In particular, there are several good chapters on graphics which show how to paint outlined shapes with colour.

The authors explain how to debug programs and make them more efficient, an important but little-stressed area in most books about Sinclair machines. It is from Shiva Publishing and costs £5.95.



The Spectrum Book of Games, by Mike James, S M Gee and Kay Ewbank, is ideal for all those who just want to enjoy the machine by playing games. It contains game listings for Space Invaders, squash rackets and even nine-hole golf. The programs are all explained but this kind of book is nothing new. Most of the games are based around Space Invaders, Breakout and Find the Treasure.

It is a good start for a beginner who wants to write or just type-in games programs. It is published by Granada Publishing, PO Box 9, St Albans, Hertfordshire AL2 2NF and costs £5.95.

Robin Bradbeer edited the Spectrum handbook and can be regarded as an expert on the machine. His new book, *Learning to use the ZX Spectrum Computer*, is an easy introduction to Spectrum Basic and some of the simple ways in which the computer can be used.

It provides a fine foundation for beginners but users who have some computing knowledge already will find little of interest in it. The book includes two appendices. The first lists additional reading material in the form of books and magazines and the second details the differences between Spectrum and ZX-81 Basic. It is available from Gower Publishing Co Ltd, Gower House, Croft Road, Aldershot, Hampshire GU11 3HR and costs £4.95.

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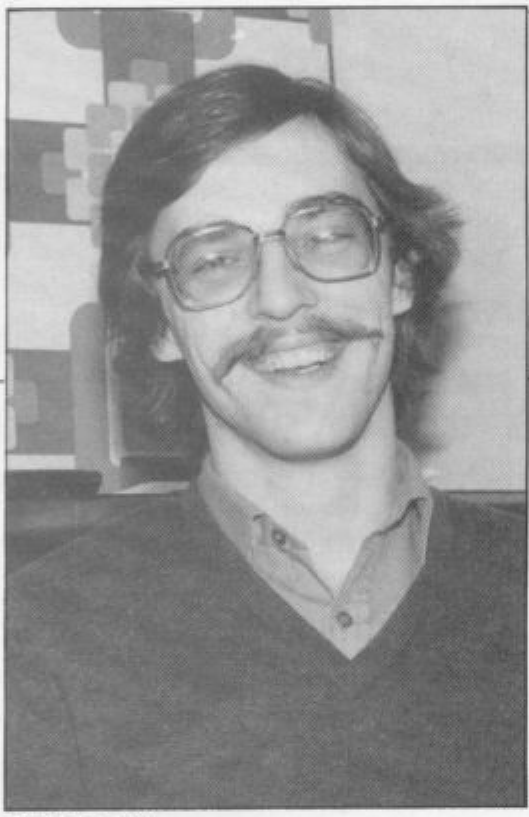
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David Janda



Tony Poulter reports on our last contest

Screen expanded in only nine bytes

AT LAST we can announce the winner of our September competition for the Data-Assette ZX-99. We asked for a program which would fill the screen using only the 1K memory of the basic ZX-81. We also asked that the program should be elegant and flexible.

We had a tremendous response, with no-one being deterred by the misprint which requested a program producing 748 characters instead of the 768 which would be needed to fill the screen. It was thought that a full screen might be impossible to achieve but we did not allow for the ingenuity of our readers. Many achieved the full screen but the winner beat that, with 816 characters being displayed.

David Janda, 21, an unemployed programmer of Durnsford Road, New Southgate, London N11, achieved it by increasing the number of characters in each line from 32 to 34 and using only nine bytes of machine code. His program is listed in figure one, completely in direct pokes. Using any kind of loader is not impossible but it is no easier to type-in. The nine bytes start at 17325, as he says the program will not work anywhere else in the memory. When run, the screen is filled, mostly by inverse Hs and the machine is in a very odd state with the keyboard dead.

What do the nine bytes do? At the start, register A contains the remainder after dividing 17325 by 256, which is 173. Put 173 in 16418 and you enable 24 lines. Put 173 in 16441 and you enable 34 columns.

GOSUB to ROM address 16 and you print 173, which is inverse H, jump back, to the second 50 in fact, until the machine gives up.

Janda says that he entered the competition as part of a challenge from a friend.

Reading a great deal of interesting material, I felt that many were speaking in a new language — the language of the readable REM. For perfection, that needs to have no spaces or question marks in it.

Figure two, a combination of two entries, is an example of how the method achieves a full normal screen of 768 characters. It has two question marks in its 13 bytes, which are then supplied by the two POKEs, and no spaces. That creates 768 of high resolution. Press NEW NEWLINE will get you out of it quickly.

To print normally have Y2 instead of Y0 and you will find you are using ROM address 2923, a string print routine which expects a start address in the DE, the ZZ and a length in BC, accidentally containing some larger number. This produces a printout of the ROM, or RAM, as readable REM.

Another way the method was used is shown in figure three which has no question marks in its 39 bytes and one space at the fifth byte. Bytes 4 to 8 are how the extra length is achieved. Error 4 is given when the stack pointer is within 36 bytes of STKEND. By increasing the stack pointer by 1K, 31 bytes are gained and nothing else is affected.

You must switch the machine off and on between examples.

The program allows you to type-in the 768 display, accepting letters, figures and punctuation, which it displays inverse. It is also possible to type STOP to return to Basic.

Useful numbers are 699, the ROM keyboard read, which sets H and L, and 1981, the ROM keyboard decode, which expects information in BC and puts in HL, the address at which the character is stored.

Figure 1

```
   0 POKE 17325,50
   0 POKE 17326,34
   0 POKE 17327,64
   0 POKE 17328,50
   0 POKE 17329,57
   0 POKE 17330,64
   0 POKE 17331,215
   0 POKE 17332,24
   0 POKE 17333,-6
   0 PRINT USR 17325
```

Figure 2

```
   1 REM M6RNDY0 GOSUB ?>ZZLN ?"
   0 POKE 16520,71
   0 POKE 16525,107
   0 PRINT USR 16514
```

Figure 3

```
   1 REM M6RND5space graphic fou
rT RAND LNinverse v graphic twoG
4 IF LN inverse v graphic two FA
ST AT GC SAVE LN inverse x graph
ic e inverse j inverse i RETURN
STOP COS RETURN RNDK NEW PLOT in
verse spaceNOT /  LPRINT
   2 GOTO USR 16514
   0 RUN
```

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Andrew Hewson.

Andrew Hewson looks at difficulties concerning the PRINT command

Finding the answer to screen filling

MOST OF the questions this month are concerned with PRINTing problems. The first is from Derek Barry of Witney, who asks: **It can be very annoying when the screen fills on the ZX-81 and the program grinds to a halt with Report Code 5. Is there a way to scroll the display automatically?**

The column and line numbers of the PRINT position are held in the system variables at 16441 and 16442 respectively. For some eccentric reason the line numbers are counted from the bottom of the screen upwards, starting at one, not from the top downwards starting at zero as with the PRINT AT command. The bottom two lines normally are reserved for INPUT and error messages, although a method for PRINTing on these lines is given later in this column; hence if 16442 contains 2 or less the program will fail at the next PRINT command.

To SCROLL the screen automatically include the following line before each relevant PRINT statement:

IF PEEK 16442 < 3 THEN SCROLL

The SPECTRUM has a separate system variable at 23692 to keep track of the number of lines which may be PRINTed before the next

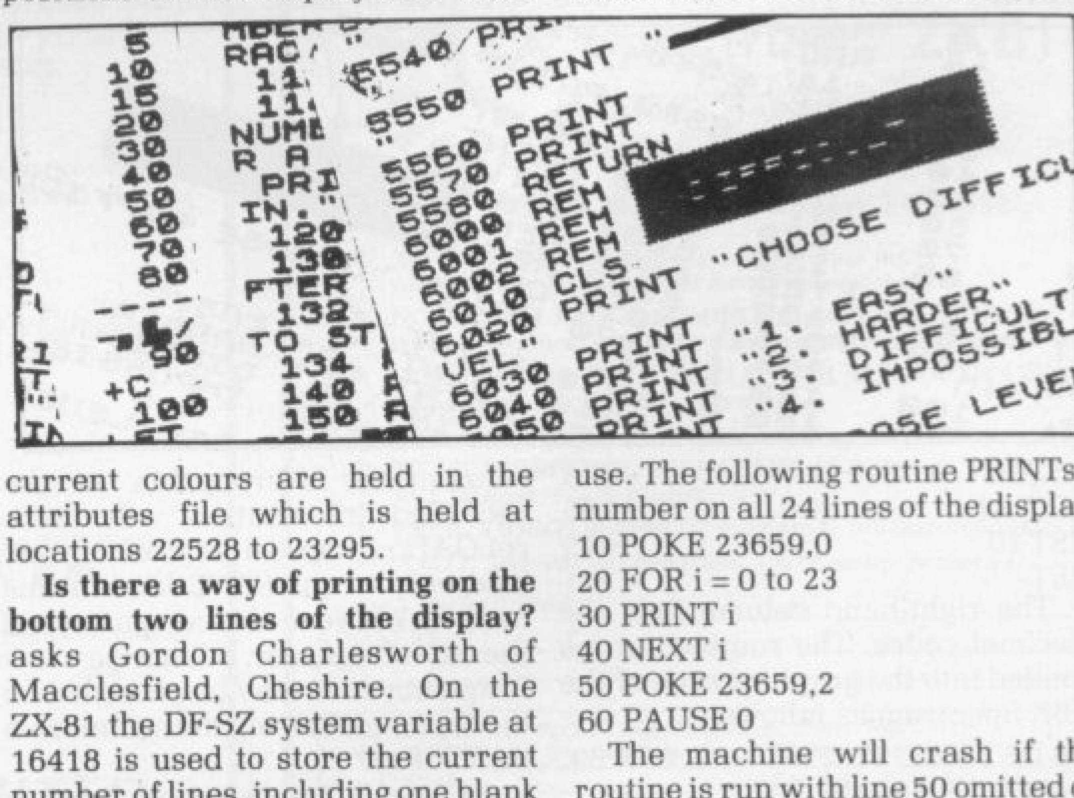
scroll?

query should be issued. To prevent the query appearing, POKE a number larger than 1 — and less than 256 — into 23692 as often as necessary.

Daniel Guillemyn of Toulouse, France asks: **Is it possible to set the colour of a pixel in the Sprectrum display independently of all the others?**

No. There are 256 × 192 = 49,152 pixels in the Spectrum display and 49,152/8 = 6,144 bytes are used simply to determine which of the pixels are illuminated and which are not. If each pixel could take any one of, say, eight colours, a further 3 × 6,192 = 18,576 bytes would be required, to say nothing of the extra hardware required.

All current colour computers make some compromise on the colour detail they support. In the Spectrum each eight by eight group of pixels which form a character position is assigned an INK, or foreground, colour and a PAPER, or background, colour. Colours can be assigned to each character position independently but changing the INK colour, for example, of one pixel in a character position also changes the INK colour of the other 63 pixels. There are 32 × 24 = 768 character positions in the display and their current colours are held in the attributes file which is held at locations 22528 to 23295.



Is there a way of printing on the bottom two lines of the display? asks Gordon Charlesworth of Macclesfield, Cheshire. On the ZX-81 the DF-SZ system variable at 16418 is used to store the current number of lines, including one blank line, in the lower part of the screen. DF-SZ is normally set to 2 and is increased only when a particularly long line is being INPUT or EDITed.

To PRINT in the lower part of the screen, POKE the value 0 into DF-SZ, as in this example:

```
10 POKE 16418,0
20 PRINT AT 23,8;"THE BOTTOM
   LINE"
30 PAUSE 32768
```

The PAUSE command is not necessary generally but I have included it in this example to prevent the STOP message being PRINTed and thereby obliterating the output from line 20.

The Spectrum stores the value of DF SZ at 23659 and the technique for PRINTing on the bottom of the screen is similar except that the machine will crash if PRINT AT is used on line 23 or if the value in 23659 is not POKEd back to 2 after use. The following routine PRINTs a number on all 24 lines of the display:

```
10 POKE 23659,0
20 FOR i = 0 to 23
30 PRINT i
40 NEXT i
50 POKE 23659,2
60 PAUSE 0
```

The machine will crash if the routine is run with line 50 omitted or if line 30 is replaced by:

```
30 PRINT AT i, i; i
```

continued on page 90



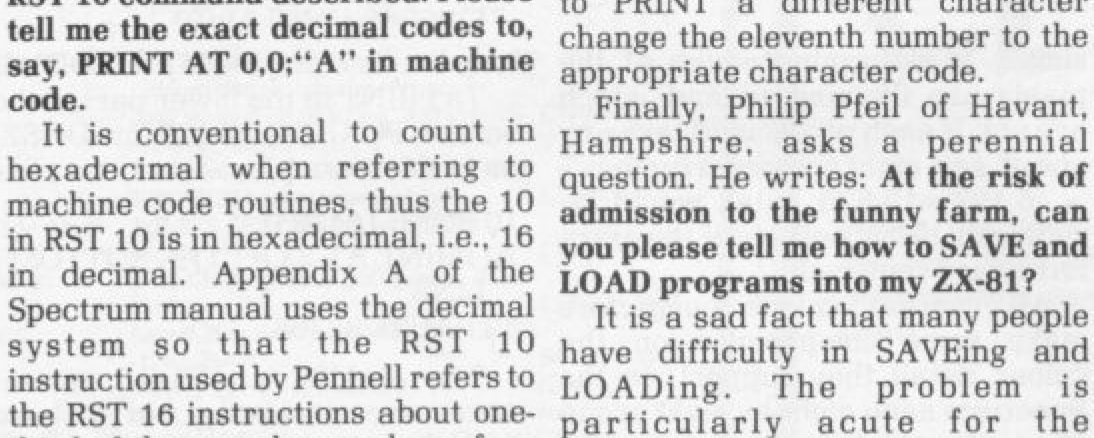
continued from page 89

Several people have asked about the machine code PRINT AT facility for the Spectrum described by Andrew Pennell in the October issue of *Sinclair User*. Andrew Beale of Tolworth, for example, writes: **I cannot find a reference in Appendix A of the manual to the RST 10 command described. Please tell me the exact decimal codes to, say, PRINT AT 0,0;"A" in machine code.**

It is conventional to count in hexadecimal when referring to machine code routines, thus the 10 in RST 10 is in hexadecimal, i.e., 16 in decimal. Appendix A of the Spectrum manual uses the decimal system so that the RST 10 instruction used by Pennell refers to the RST 16 instructions about one-third of the way down column four on page 186 of the manual. The decimal code is 215. The following routine is the machine code equivalent of

PRINT AT 0,0;"A"

```
LD A,16     62 22
RST 10        215
LD A,0      62 0
RST 10        215
LD A,0      63 0
RST 10        215
LD A,41     62 65
RST 10        215
RET           201
```



The right-hand column lists the decimal codes. The routine can be loaded into the graphics area of the 16K Spectrum as follows:

```
10 DATA 62, 22, 215, 62, 0, 215, 62, 0, 215, 62, 65, 215, 201
20 FOR i = 32600 TO 32612
30 READ a
40 POKE i, a
50 NEXT i
```

To call the routine, initialise the PRINT position and then use the USR function, for example:

```
100 PRINT
110 RAND USR 32600
```

To alter the Y and X PRINT AT co-ordinates, change the fifth and eigth numbers in the DATA statement and to PRINT a different character change the eleventh number to the appropriate character code.

Finally, Philip Pfeil of Havant, Hampshire, asks a perennial question. He writes: **At the risk of admission to the funny farm, can you please tell me how to SAVE and LOAD programs into my ZX-81?**

It is a sad fact that many people have difficulty in SAVEing and LOADing. The problem is particularly acute for the newcomer to the ZX-81 who has not had the experience to diagnose a fault. None of the advice I can offer is original; most of it has been published several times but I repeat it because about five percent of the letters I receive are from people who cannot LOAD and/or SAVE.

When SAVEing a program, make sure that the cassette and the player are free of dust, because even a momentary interruption in the recorded information will make reLOADing impossible. Connect one lead only — the SAVE lead in this case — between the computer and the cassette player, otherwise a low frequency hum may be recorded on the tape, smothering the signal from the ZX-81.

A television set generates a strong oscillating electric field and the result can be a high-pitched noise recorded on the cassette. The



cure is to keep the cassette player at least three feet from the TV set. Always SAVE at least two copies, thereby increasing the probability of obtaining an adequate copy.

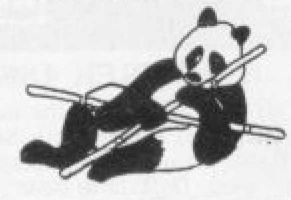
Some people suggest that batteries should be used to power the cassette player so that there is no possibility of picking-up interference through the mains supply. I have always found that batteries are more trouble than they are worth; even the high-power versions drain very rapidly, causing the cassette player to run too slowly.

Similar precautions should be taken when LOADing a tape but you must also adjust the volume on the cassette recorder to the required level. If the sound is not loud enough to make you wince when the tape is played with the EAR lead disconnected from the recorder you are unlikely to be able to LOAD the program satisfactorily.

When LOADing, the TV display should show fluctuating broad black and white bands like a zebra crossing. If the volume is low the bands will not appear or the black parts will be interspersed with white. If the volume is too high the screen will appear almost entirely black. Adjust the volume by making a dummy run through the tape.

If you find SAVEing and/or LOADing is impossible, your next step should be to isolate the problem as it could be the tape, the cassette player or the ZX-81. The easiest way to do so is to contact a fellow ZX-81 owner and swap your items with his until you are certain which unit is at fault. Even if the other person is a complete stranger, you will no doubt have an enjoyable time swapping tips with him which may be some consolation if the worst comes to the worst and you have to return your computer for exchange or repair.

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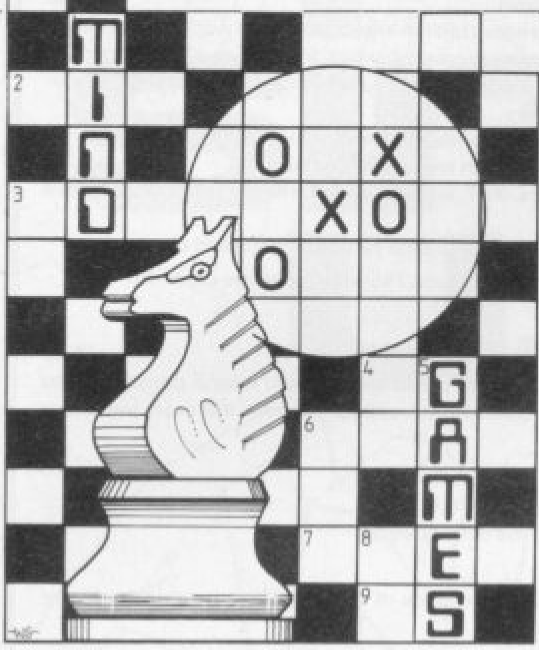
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Philip Joy sorts through his postbag and finds a chess cassette which speaks

Good response to first puzzle

THERE was a fantastic response to my first puzzle. Many correct answers and only a few incorrect ones. I will include the best program with respect to size, technique, and speed. It was sent by W E Thomson, of Aldeburgh, Suffolk. While most took six to 10 minutes, this took only one minute five seconds.

There was a mistake on my part to the solution given last month; it should be 1,548,137. To use the program it should be typed into a ZX-81 but it should work on a Spectrum. When it is run the highest number to test is required; in the puzzle case that is 5000. The program will then sum all prime numbers below that number:

```
10  FAST
20  INPUT M
30  IF M< 3 THEN GOTO 20
40  LET L=INT (M/2)-1
50  LET Q=-INT (-SQR M)
60  DIM P$(L)
70  LET T=3
80  LET S=6
90  LET N=3
100 LET M=1
110 FOR I=(M+M)*(M+1) TO L
    STEP N
120 LET P$(I)="X"
130 NEXT I
140 FOR M=M+1 TO L
150 IF P$(M)="X" THEN NEXT M
160 IF M=L+1 THEN GOTO 220
170 LET N=M+M+1
180 LET T=T+1
190 LET S=S+N
200 IF N< Q THEN GOTO 110
210 NEXT M
220 PRINT "NUMBER OF PRIME
    NUMBERS=";T,"SUM OF
    PRIMES==";S
230 SLOW
```

There was a program sent by B C Woodrow of Dorset. He says he has had his ZX-81 only since September and while not the best version, it was very good.

The Quicksilva 48K Spectrum chess program has been sent. It seems to have some space age theme about it, as the short story with it is like a science fiction story. The game has speech, something you may or may not be able to hear. It also has six levels of play, analysis of moves, and a save game option. The game, called the Chess player, is available from Quicksilva Ltd, 92 Northam Road, Southampton, SO2 0PB.

'A very good way of testing programs is to find in how many moves mate can be achieved. It is easy to create a mate problem and gives the most accurate check'

Now to a letter first mentioned a few months ago from Simon Gross of Ipswich. He says that to put a chess program through tests, to see how good it is, is best done by recording results, as opposed to studying the program. Studying a program of 9K machine code is not a very easy task. It is a very skilled job to look objectively at the skill sector of a chess game, let alone unravel the machine code as well.

Recording results about the look ahead and speed is much easier. I must agree that very few people could look at so much machine code and decide how a game will play.

Gross suggests mate in so many moves type of problem, so that the program has to look ahead; the better programs will find mate easier and earlier. That is a very good way of testing programs and anyone can create a mate problem. The time it takes to work out the problem, if it does, is noted. That will give the most accurate check on chess games the average person can do.

It may give you some insight into how to beat your version of chess in the end-game. If you make up the problems, your own game will be improved. Different versions will act differently, so you can try it on all your versions. If you discover anything interesting, send the details.

For this month's puzzle I have devised a cunning maths problem: 1.2.3.4.5.6.7 = 16 5/6 or 16.833333

The dots are either +,-,* or /, but which is which? The idea is to get your ZX-81 or Spectrum to find what each individual dot is. The program must work out the answer. Send the answers and program, again no prizes, but the best one will be published in a future issue. Remember that 1+2*4 is 9 and not 12, i.e., multiplication first.

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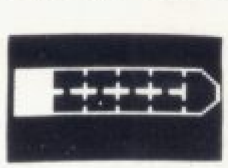
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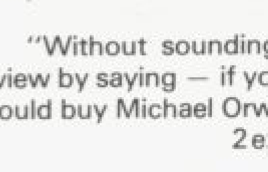


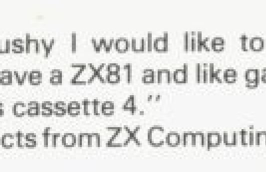
Repair your Starship before disaster strikes. Hazards include asphyxiation, radiation, escaped biological specimens and plunging into a Supernova.

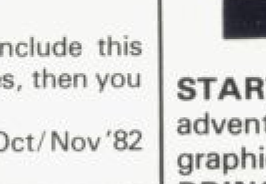
STARTREK This version of the well known space adventure game features variable Klingon mobillity, and graphic photon torpedo tracking.
PRINCESS OF KRAAL An adventure game.
BATTLE Strategy game for 1 to 4 players.
KALABRIASZ World's silliest card game, full of pointless complicated rules.
CUBE Rubik Cube simulator, with lots of functions including 'Backstep'.
SECRET MESSAGES This message coding program is very txlp qexi jf.
MARTIAN CRICKET A simple but addictive game (totally unlike Earth cricket) in machine code. The speed is variable, and its top speed is very fast.
Cassette 3 costs £5.

CASSETTE 4 **8 games for 16k ZX81**

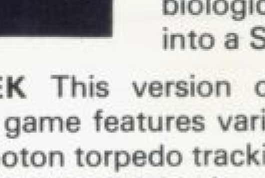
ZX-SCRAMBLE (machine code) with 3 stages.
Bomb and shoot your way through the fortified caves.



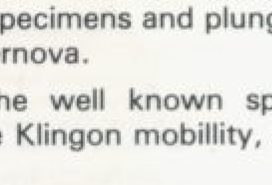


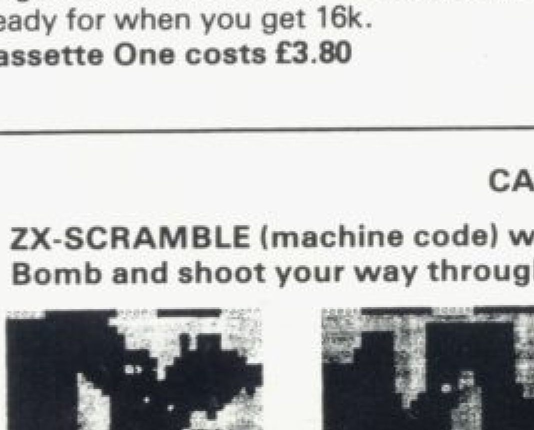


GUNFIGHT
(machine code)



INVADERS
(machine code)





GALAXY INVADERS (machine code)
Fleets of swooping and diving alien craft to fight off.
SNAKEBITE (machine code)
Eat the snake before it eats you. Variable speed. (very fast at top speed).
LIFE (machine code)
A ZX81 version of the well known game.
3D TIC-TAC-TOE (Basic)
Played on a 4 × 4 × 4 board, this is a game for the brain. it is very hard to beat the computer at it.

7 of the 8 games are in machine code, because this is much faster than Basic. (Some of these games were previously available from J. Steadman). Cassette 4 costs £5.

Recorded on quality cassettes, sent by first class post, from:
Michael Orwin, Dept. SU, 26 Brownlow Rd., Willesden, London NW10 9QL (mail order only please)